

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXXVII.

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No. 863.

Entered at the Post-Office at Boston as second-class matter.

JULY 9, 1892.



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by both. It is the universal experience of lawyers that, in building cases, the decision of the court almost invariably agrees with the opinion of the architect; and to take away the architect's independent authority, by making him the mere agent of one of the parties to the contract, is virtually to compel builders to have their controversies with the owner dragged through the courts, at enormous expense, in place of having them decided on the spot, without appeal, by the man who knows most about the circumstances, and is, by position and training, best able to judge of them fairly. On the owner's part, the appointment of the architect by the contract as his agent would not only deprive him, as well as the builder, of an impartial and skilful referee in all disputes connected with the building, but, in some States, by making the owner constructively present, in the person of the architect, at the carrying-out of the construction, would expose him to claims for damages for accidents due to the carelessness of irresponsible contractors; and it is well known that, where there is any chance of involving a well-to-do owner in such suits, the lawyers who conduct them often make enormous demands, on the smallest pretext. For these reasons, the Boston form specifies clearly the duties and responsibilities of the architect under the contract, leaving it to be inferred that he does not act for the owner in any other way; while a still stricter, and, as we think, better form, which lies before us, says unmistakably that "The architect shall not be deemed the agent of the owner for any purpose whatever, except as the owner may in fact give him a special and express authority."

THE Boston Society of Architects some time ago, before the same thing was done by the joint committee of the American Institute of Architects, the Western Association of Architects, and the National Association of Master Builders, undertook to prepare, for the use of its members, a form of contract, which should embody the collective wisdom of the Society, and retained Mr. Louis D. Brandeis, a careful and experienced lawyer, as professional adviser. The work has proceeded slowly, and, even now, nothing more has been done than to draw up what is modestly called a "Suggestive Form of Contract," which we published last week, together with an excellent draft of General Conditions, such as are now almost universally attached by architects, on a printed sheet, to specifications of all sorts, and a letter from Mr. Brandeis to the Secretary of the Society, in which he makes an interesting comparison of the Society's form with that adopted by the official committee of architects and builders. It should be observed that the Boston Society does not put forth its form as one for general adoption. It considers, as the note accompanying the document says, that each architect is likely to find some special form best suited to the exigencies of his work, but it believes, with reason, that a comprehensive model, to which each one can turn for examples of provisions to meet particular circumstances, will be useful. With this belief we fully agree, and it is, therefore, not with any idea of criticising the excellent work of Mr. Brandeis and the Committee of the Society, but in the hope of suggesting some useful additional considerations on this all-important subject, that we are disposed to comment at some little length on the new documents.

THE first clause of the Boston form, relating to the mode of doing the work, is admirable, its only questionable point being derived, as it appears, from a too anxious desire to be perfectly fair. Speaking of detail drawings, the clause reads, "The contractor shall apply to the architect for whatever further drawings or specifications may be necessary to explain the work to be done, and shall conform to such additional drawings and specifications as if they had been originally part of this agreement, provided they are reasonably consistent with the original plans and specifications, which, being identified by the signatures of the parties hereto, are to be deemed a part of this agreement." To the experienced architect, the question will immediately occur, "Who is to be the judge whether the 'additional drawings' are reasonably consistent with the original plans? And what is there to prevent a builder from claiming that all the details offered him are inconsistent with the original plans, and using this pretext to delay the building until every detail drawing has been passed upon by three arbitrators, after ten days notice to the owner in each case?" Of course, the intention is to protect the contractor from any attempt of the architect to show more work on the detail drawings than was contracted for, but, in practice, builders rarely suspect, or have reason to suspect, any such intention on the part of the architect; and we have never known any objection to be made to signing a contract in which the architect is made the sole judge of the conformity of the detail drawings with the contract. Our own form says, "If complete drawings of detail have not yet been made, the same when made, and conforming to said plans and specifications, are to constitute a part of this contract, the Architect being the sole judge as to whether said detailed drawings conform to said plans and specifications"; and this clause, by making the man who knows most about the matter the judge of it, effectually cuts off opportunity for squabbles and delays, while the builder is perfectly protected by the fact that the architect is bound to use his judgment fairly, and that, if he attempts any fraud, he can be compelled to pay the damages caused by his fraud out of his own pocket.

IN the letter accompanying the papers, Mr. Brandeis speaks of what he calls the objectionable provision of the Institute form, which makes the architect the agent of the owner, as distinguished from the form proposed by the Boston Society, and those generally in use among Eastern architects, in which the powers of the architect as agent for the owner are strictly limited by the contract itself. There is no doubt that this particular clause of the Institute contract is the greatest obstacle to its general adoption, and, while it is easy to understand that builders would like to simplify the dual authority under which they have hitherto acted, by combining the architect and the owner into one, this confusion of two distinct and independent authorities not only, as Mr. Brandeis says, increases unreasonably the architect's responsibilities, but it deprives the honest builder of his best reliance, the judicial position of the architect, as an impartial man of science, agent for neither the owner nor contractor, but the judge agreed upon and accepted

A SHARP, but short contest took place last week between the leaders of the building trades organization in New York, and some of the contractors, which ended, for the moment, happily for the latter, although it seems by no means certain that their cunning and unscrupulous opponents may not yet find an opportunity for striking an unexpected blow in return. It will be remembered that, at the time when Mr. Downey's shop was made the battle-ground of a dispute between the carpenters and joiners, as to what work should be

done by each, an engineer, named Paul Chandler, employed by the Jackson Iron Company, refused to leave his work when ordered to do so, in furtherance of some tactical manoeuvre in the contest, by the walking-delegate of the engineers. For this insubordination he was suspended from the engineers' union. Before his sentence expired, he was set to work in the new Criminal Court building, but the union men refused to work with him, and he finally compromised with the union by paying a fine of fifty dollars, on which the union men were allowed to return to their work beside him. Immediately afterward, however, it appeared that the foreman, and two other men, had gathered up the tools that the men dropped on the floor when they struck against Chandler, and they were fined, and the building struck again, until the fines should be paid. Chandler, of course, was ordered to strike with the rest of the men, but his independent spirit again led him astray, and he refused. The union then demanded that the Jackson Company should discharge him altogether, this being, of course, the preliminary step to hunting him and his family into the almshouse. The Jackson Company took him away from the Criminal Court building, but set him at work elsewhere. When the walking-delegates discovered that their victim was still earning his living, they resolved, as they themselves said, to "compel the Jackson Iron Works to employ only union labor," in other words, to turn out Chandler, and made a formal demand upon the Jackson Company to discharge all non-union men. The Jackson Company replied that it intended to employ only union men, and believed that all the men in its shops were members of some union, but the walking-delegate in special charge of the strike proposed to go through the shops, and call for the "union cards" of the men, these cards, as every one who sees anything of the building trades knows, being the tickets of permission to earn an honest living which American citizens have to purchase from a set of domineering conspirators, who revoke them at their pleasure.

AS the Jackson Company declined to accede to this inquisition among their men, the walking-delegates changed their ground, and proposed an "arbitration." To Mr. Chandler, at least, this proposition must have suggested the idea of an "arbitration" between the lamb and the hungry wolf; but the Jackson Company agreed to it, appointing Mr. Cornell, of the Cornell Iron Works, on their side, while Mr. Hicks, the walking-delegate in command of the strike, appointed himself on the other. When, however, these two arbitrators came to the selection of a third, it was found impossible for them to agree. Mr. Cornell suggested the Rev. M. D. C. Crawford, or District Attorney Walker; while Mr. Hicks proposed Dr. Huntington, the rector of Grace Church, or Mr. William Sulzer, of the New York Legislature. Why Dr. Huntington should be expected to leave his duties to his church, to act as the representative of the walking-delegates in their persecution of poor men, we cannot imagine, but his name is frequently mentioned in connection with labor troubles. However, neither of the persons proposed by one arbitrator proved acceptable to the other, and the arbitration was abandoned, presumably because there was really nothing to arbitrate, and each party felt that nothing was to be gained by delaying the inevitable contest. The battle was begun by Hicks, who ordered the housesmiths, the carpenters, the cartmen, the material-handlers, the drivers of wagons for delivering material, and the hoisting-engineers, to strike in all buildings where any of the Jackson Company's men were at work, or their material in use. Since the great strikes of last year, however, in which an iron-master was forced to allow an insolent bully, whom he had once ordered out of his shops, to go through it from end to end, as an emissary of the unions, the iron-workers have formed a league for mutual support; and the members came to the relief of the Jackson Company by giving notice that, inasmuch as it appeared that the housesmiths' union was primarily responsible for the trouble, they had decided, unless the strike against the Jackson Company was abandoned by a certain date, to discharge all members of that union from their shops.

OF course, this announcement was received with the usual threats of a mortal struggle between the Iron League and the unions, but the housesmiths are apparently sick of being forced into ruinous strikes for the delectation of the

walking-delegates, and it soon became evident that, on the appointed day, the members of the Iron League would find very few men in their shops who would acknowledge allegiance to the unions. It was, of course, to be feared that the unions, by secret orders, would instruct the men to deny their membership, so as to keep them in the places where they could do most mischief, and, as a precaution, the League took measures to ascertain the names of the union members, but the defection turned out to be more real than was anticipated, and, on the day set for the decision of the question, nearly all the men appeared at the shops, asking for work, and giving assurance that they were no longer members of any union. This, of course, ended the controversy, so far as they were concerned, and the League is now addressing itself to the task of clearing away the last of the annoyances directed against it by the walking-delegates, by arranging for the delivery and hoisting of materials independently of the delegates' consent.

A VERY interesting experiment is to be undertaken by the Norwegians, who have subscribed sufficient money for the construction of a vessel like those used by the Norse pirates of the twelfth century, and propose to send it by sea to the Chicago Exposition, manned and sailed, so far as possible, in the same manner as the boats of the Vikings who were contemporary with Leif Erikson. Of course, this method of navigation involves rowing, and a crew of thirty educated men is to be formed, who will ply the oars during the voyage of five thousand miles. The result of the attempt will be watched with attention, not only by persons of athletic tastes, but by students of history. It is certain, from the accounts of ancient writers, that the vessels of antiquity were propelled by their oarsmen with a swiftness equal to that attained by the steamboats of the present day, and there is reason to believe that the great quadriremes and quinqueremes of the Roman navy would far outstrip, in smooth water, any modern steamers. Whether this was owing to the method of rowing, or the model of the vessels, or both together, is uncertain, and a serious trial will throw much light on the subject. We know exactly what the shape of the Norsemen's ships was, one having been dug out of a bog, many years ago, in almost perfect preservation, and placed in a museum, where it still remains; and there are tapestries and illuminations in existence which show tolerably well the methods of rigging, and disposition of the rowers. We suppose that modern simplicity will hardly allow of dressing up the volunteer oarsmen in armor and eagle helmets, but one can hardly help regretting that such an opportunity for picturesque effect as would be afforded by the arrival at the Exposition wharf, in Chicago, of a galley filled with long-haired Norse pirates, clanging their short swords against their shields, in time to the chorus of a Gothic war-song, should be lost.

THE New York Journal has an idea, which it is pressing with commendable persistence. It thinks that, by giving up the flat roofs of tenement and apartment houses to clothes-lines, a great opportunity is wasted; and that if they could be made safe and comfortable, and still more if they were to be adorned with plants and flowers, the tenants of the house underneath, half-suffocated, during the hot summer nights, in their close rooms, might spend at least their evenings in a comparatively cool, fresh atmosphere, which would save many of them from the attacks of the diseases which always follow a "hot spell" in New York. Especially would young children be benefited by a simple arrangement of the kind. It is agreed by physicians that the troubles which decimate the infant population of the city in midsummer are mainly due to foul air, and exhaustion from heat; and, while the air on top of a tenement-house in New York is not as pure as that among the Catskill Mountains, a breeze usually comes up at night from the rivers which is, at least, sweet and refreshing in comparison with the atmosphere which hangs about the street below. Whether much would be likely to come of the idea of making a garden of the roof-space, we do not know. A very rich private owner, or an association of rich occupants of a fashionable flat, might beautify a roof in this way, much to their own satisfaction, but it would take a great many plants, and a good deal of care, from a skilful florist, to keep them in the condition of luxuriant growth indicated in the *Journal's* illustrations.

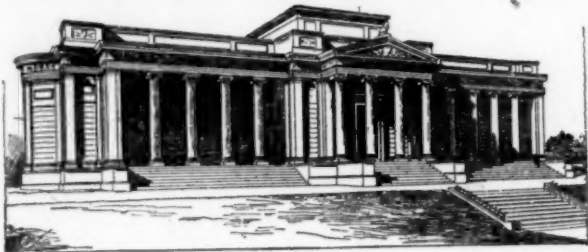
MODERN ARCHITECTURE.¹—II.

Fig. 4. The Mappin Art-Gallery at Sheffield, Eng.

LET us now glance at a few public edifices, with the idea of observing the different predominant tendencies displayed in them. The Mappin Art-Gallery at Sheffield (Fig. 4), by Messrs. Floken and Gibbs, is an example of that Classic style which cannot properly be said to belong to any one country. The pediment, colonnade and attic are elements which any architect may essay to combine, and the results obtained are often praiseworthy; but at the present day scarcely any more originality can be hoped for in this path, for it is open to all the schools of art the world over.

In the sketch of "Gothic Architecture" in this Encyclopedia we take occasion to speak of a very curious disposition of Gothic vaulting in the old kitchen of the monastery of Durham. To quote our words: "The conditions were simple. A large aperture was to be arranged for, over a large room, to allow the smoke to escape. The disposition which strikes us as very original is seen in the ribs required to support the central opening. A small problem of construction was proposed here, the solution of which became quite interesting as soon as, in accordance with Gothic teaching, it was out of the question to establish a vault *en coupole*, or any other similar vault that would be calculated to support itself, in spite of the aperture. Groined vaults on ribbing or diagonal arches must be employed. The plan shows the arrangement adopted. The diagonal arches are in parallel pairs, which are at the same time parallel to the sides of the octagon. If the direction of the joints of each of the sections of the entire vault be observed, it will readily appear that each of these lunes springs from the ribs or diagonals and is borne by them; all the weights being symmetrical, the thrusts buttress each other

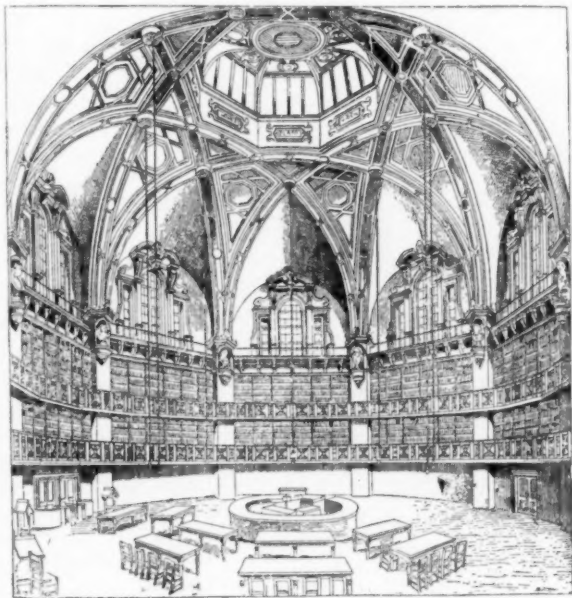


Fig. 5. The People's Palace Reading-room, London, Eng.

exactly and assure perfect balance. . . . This is a very pretty and clever solution of a little problem that was not without its difficulties."

We have since had the pleasure of learning that our view, as expressed above, was shared by English architects; we find

the same disposition employed by Mr. E. R. Robson, in the vaulting over the reading-room of the People's Palace of London (Fig. 5). Mr. Robson has himself taken the trouble to state that it was the old Gothic disposition in the kitchen at Durham which suggested that adopted by him in this wholly modern edifice. Developed, enriched and decorated, this



Fig. 6. Museum of Natural History, Kensington, Eng.

primitive disposition takes on great beauty, and the *ensemble*, though really quite rational and simple, still in its structural principles is nevertheless very sumptuous and varied. In the hands of a skilful artist it furnishes a happy arrangement for the lighting of a room from the roof, and it offers a basis for a fine system of decoration. It may also be remarked that, though of Gothic origin, it can be adapted with perfect ease, as here, to an entirely different style.

With the Natural History Museum at Kensington (Figs. 6, 7) we again turn to the modern Romanesque, so dear to Mr. Waterhouse and which he handles in a genuinely superior manner. We find here likewise the lofty towers which modern English architects are apparently unable to dispense with. In religious structures, there would seem to be nothing extraordinary in their use, but they will be seen in increasing numbers on all sorts of civil edifices. They doubtless indicate a marked demand for silhouettes, for broad outlines against the sky whose prominence and height announce the presence of the construction from a distance. The disposition is doubtless

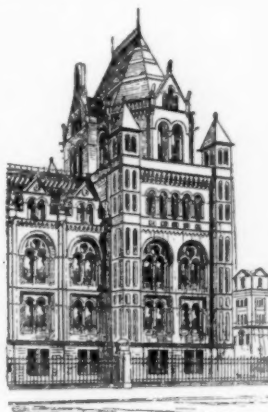


Fig. 7. Pavillon of the Kensington Museum.

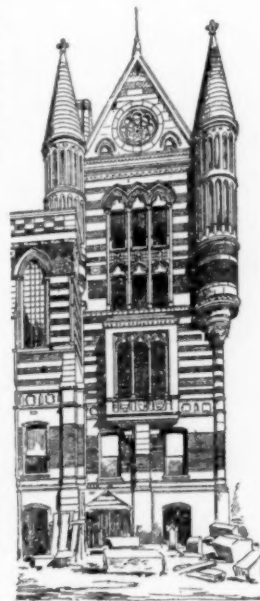


Fig. 9. From the New Law-Courts, London, Eng.

also largely necessitated by the mistiness and dullness of the atmosphere; it has frequently been remarked that the crownings of southern structures are simple and rectilinear, but that roofs are carried higher and higher, with more and more complicated silhouettes the farther north one goes. In addition to climatic constructional requirements, it is evident that glowing sunlight sets off the plainest forms, which for that reason

¹ From the French of P. Planat, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 862, page 5.

may amply satisfy the claims of beauty; but against a gray sky, in an atmosphere which shadows and weakens shapes,

plicity of vertical divisions, the same breaking up of roof lines, with the same steep pitch, the same towers and spirelets. Un-

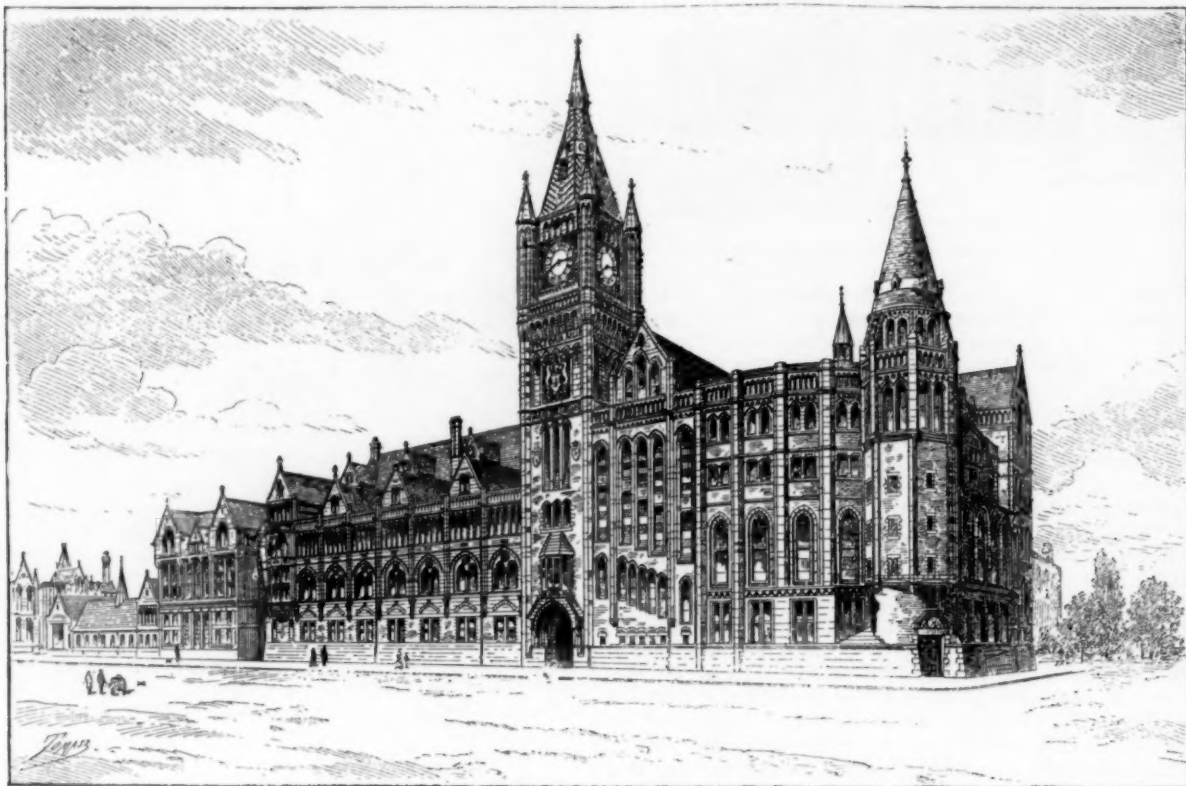


Fig. 8. University College, Liverpool, Eng.

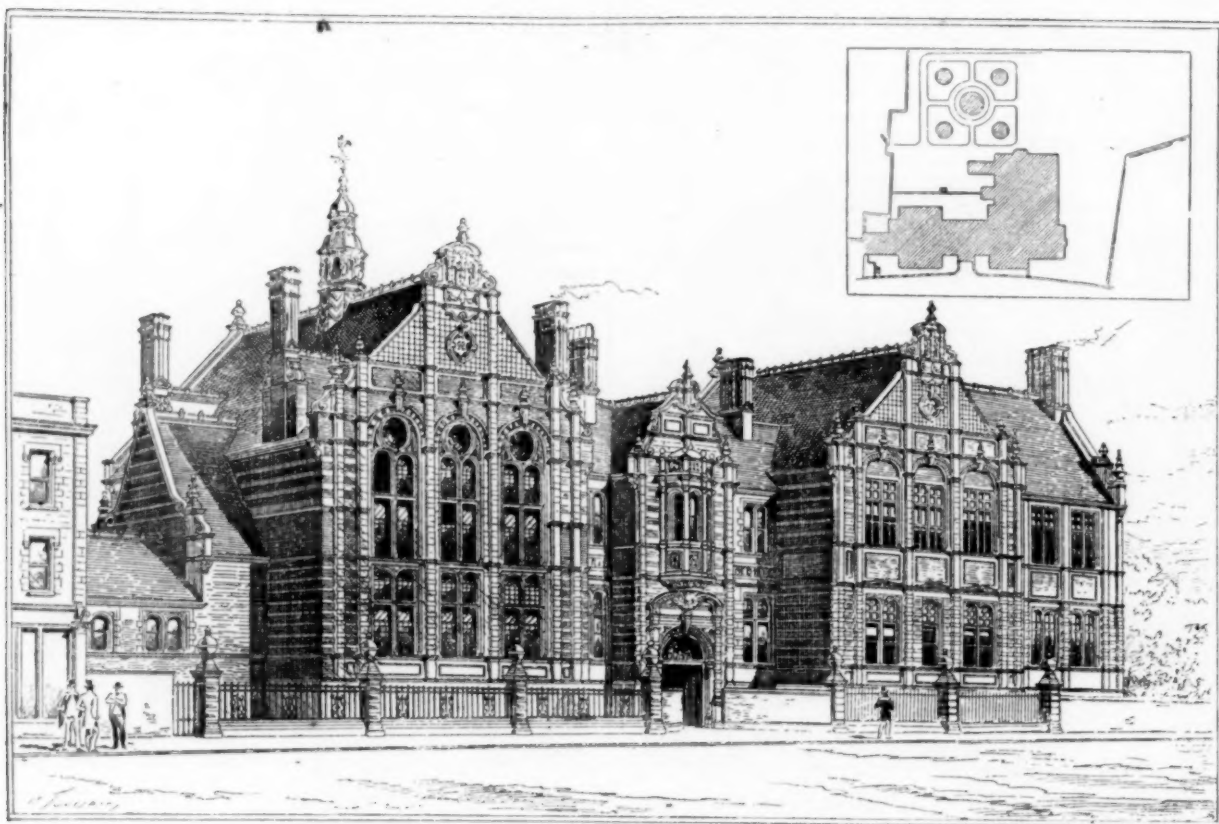


Fig. 10. Girls' School, Bristol, Eng.

vigorous, strongly accented projections, steeples and towers become indispensable elements of architecture.

All this very naturally applies also to the University College at Liverpool (Fig. 8), by the same architect. It exhibits the same forms, though somewhat more pointed, the same multi-

questionably these peaked silhouettes, springing so boldly into the air, are intended to reach lighter and less misty sky-spaces higher up, against which their masses and prominences stand out in relief.

One of the most important of London edifices is the recently

constructed New Law-Courts building, by Street. Like many other English structures, it presents a rather complicated mixture of divers elements. A Gothic inspiration is recog-

In the preceding examples we have detected Romanesque or Gothic survivals. It will not be difficult to discover the influence of the Renaissance in the following: the Girls' School

Fig. 12. Metropolitan Life Assurance Building, London, Eng.

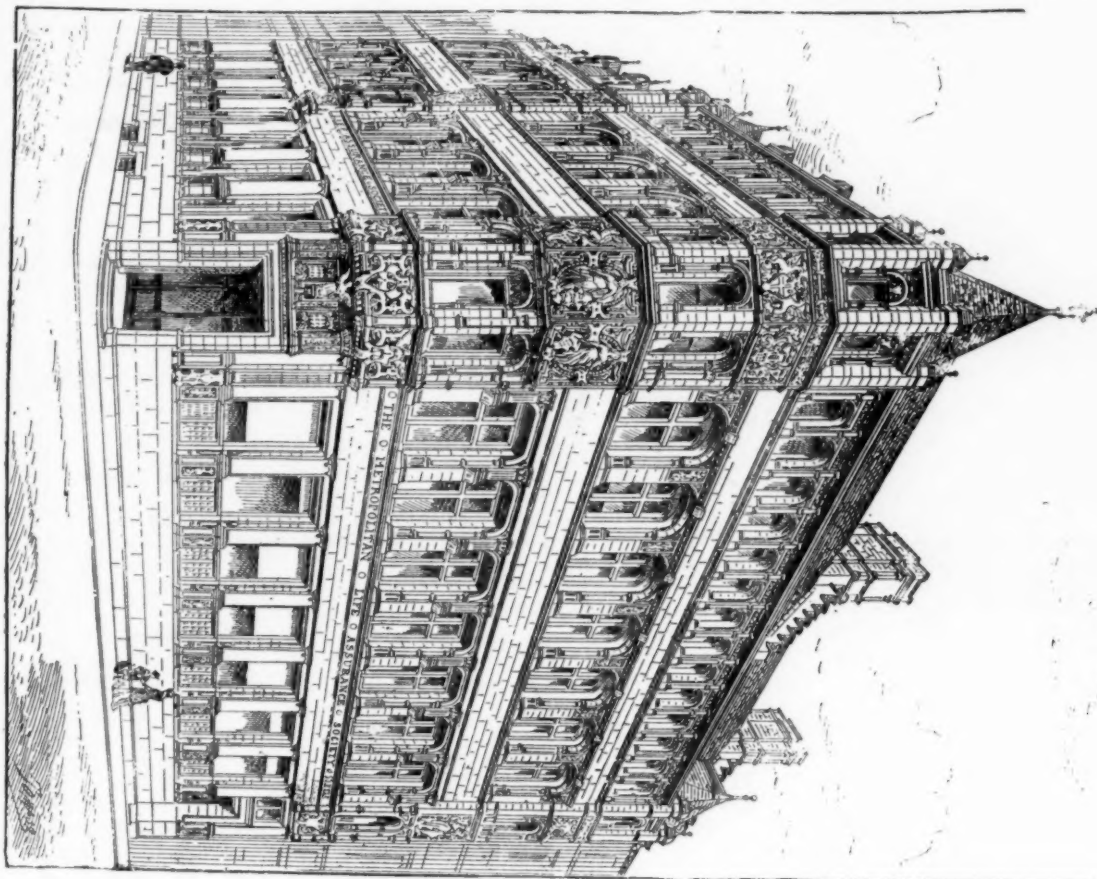
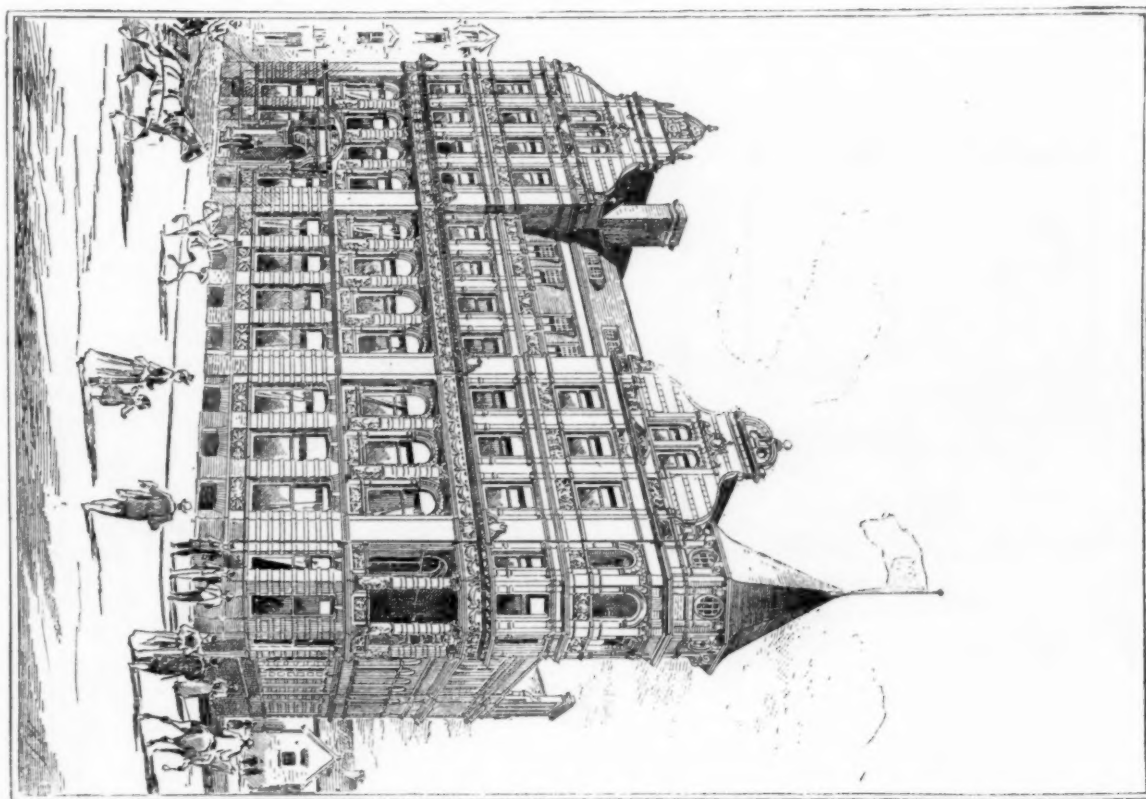


Fig. 13. Liberal Club, Leeds, Eng.



nized at once, but along with this are modern forms of bays and differently colored courses which are somewhat confusing to the casual observer.

at Bristol (Fig. 10), by W. V. Gough, belongs to the English Renaissance type whose character is not without analogy to that of German, Dutch or Flemish constructions; the great

number of superimposed bays between the vertical divisions, and the carved and complex gables are the result of that influence. The town-hall at Leamington (Fig. 11), constructed, we believe, by Mr. Cundall, with its square bays, its porch and its more Classic columns, belongs to a somewhat later English



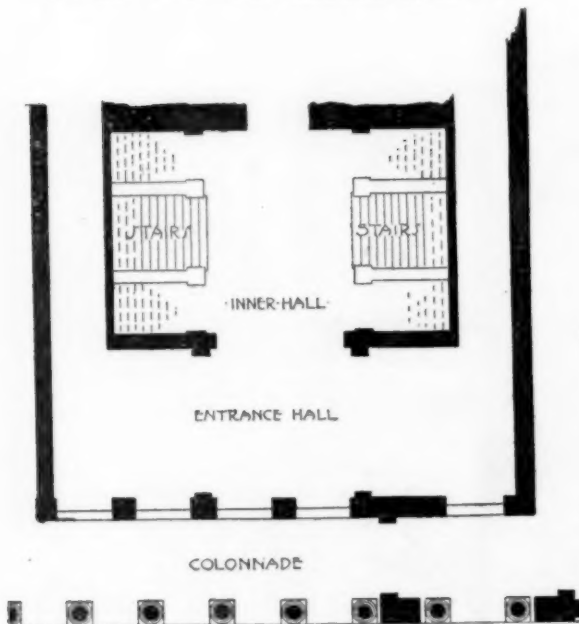
Fig. 11. Town-Hall, Leamington, Eng.

Renaissance; the tower, a necessary adjunct of every edifice of the kind, is on one of the rear angles, instead of being on the façade or in the axis, as is the case always in France.

The Metropolitan Life Assurance Society building (Fig. 12), of London, by Messrs. Aston Webb and E. Ingress Bell is also in a nearly German style. As an interesting example of English club architecture we reproduce the building of the Liberal Club of Leeds, by Messrs. Chorley and Cannon (Fig. 13), which is related, though less closely, to the style of the same period; there are angle turrets and gables *à volutes*; a few details of the entrance-way indicate with apparent certainty the architects' attempt to recall at some point the old national architecture; but modern demands as to interior distribution, the necessity of economizing space and bringing the bays close together, and the superimposition of a number of stories made it impossible to carry the resemblance very far.

[To be continued.]

THEATRE BUILDING REGULATIONS.¹—IV.



Colonnade Entrance-hall and Staircase, H. M. Opera-house, Haymarket, London.

THE further rules as to doors in London are that all internal doors must be so hung as not to obstruct, when open, any gang-way, passage, staircase or landing.

No door shall open immediately upon a flight of steps, but a square landing at least the width of the doorway shall be provided between such steps and such doorway.

All doors used for entrances and all gates must be made to open

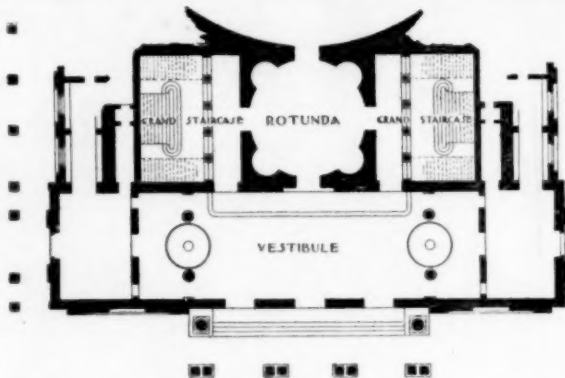
¹ Continued from No. 855, page 105.

both ways, and shall, when opened inwards, be locked back against the wall in such a manner as to require a key to release them.

CORRIDORS AND PASSAGES.

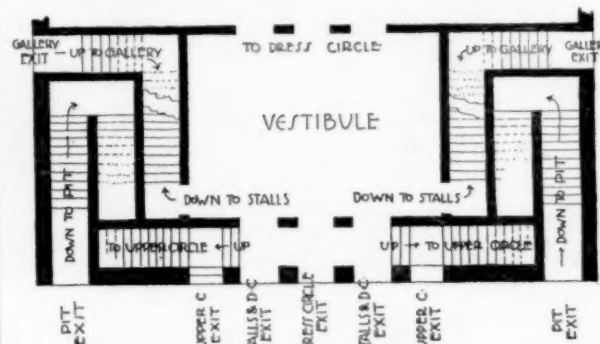
I have already alluded to the width required by the London authorities for corridors, etc. The rule reads as follows:

[London.] "Every staircase, landing, lobby, corridor or passage intended for the use of not more than four hundred persons of the



Grand Staircase Rotunda and Entrance Vestibule, Theatre Royal, Drury Lane, London.

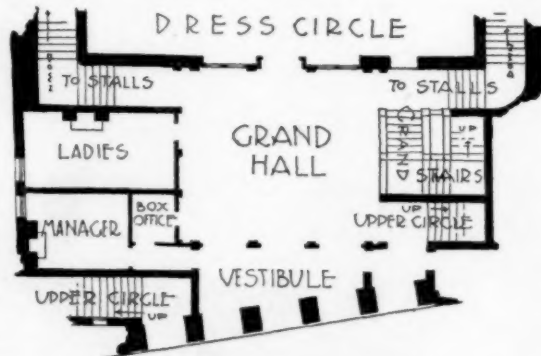
audience shall be formed of fire-resisting materials, and shall not be less than four feet six inches wide; but, if communicating with any portion of the house intended for the accommodation of a larger number of the audience than four hundred persons, it shall be



A Suggestion.—The object of this scheme is to obtain two separate staircases and exits from each part of the house and to construct the staircases within the least possible space. In this diagram the dress circle is supposed to be on the street level; the pit and stalls 12' below the ground level; the upper circle 16' 6" and the top of the gallery 40' above the ground level. The necessity of the upper circle entering from the vestibule is regarded.

increased in width by six inches for every additional one hundred persons until a maximum width of nine feet be obtained."

[New York.] In New York, the width is calculated so that the aggregate capacity of the lobbies, corridors, passages and rooms for the use of the audience must, on each floor or gallery, be sufficient



Entrance-hall and Vestibule, New Theatre, Cranbourne St., London. Spencer Chadwick, Architect.

to contain the entire number to be accommodated on the said floor or gallery in the ratio of two hundred and fifty superficial feet of floor-space for every one hundred persons. The passages must not be less than four feet in width.

[Brussels.] The Brussels regulation for corridors is very simple: the width of the several corridors shall not be less than the exit to which they lead.

[Paris.] Paris merely requires the corridors to be in proportion

to the size of the theatre. The auditorium must have a passageway all round eight feet two inches in width.

[*St. Petersburg.*] The corridors surrounding the boxes of the upper tiers in St. Petersburg theatres must be connected by special staircases with foyers surrounding them on all three sides. For

every two tiers of boxes there must be constructed not less than one "étage" or foyer with windows on the outside. From the foyer, on the three sides of the auditorium, there must be wide stairs leading to the vestibule. In lieu of this arrangement, which seems specially adapted to opera-houses where the tiers are filled with private boxes, an alternative is permitted by means of special staircases from each tier leading to the vestibule, where the cloak-rooms are constructed, or directly to the outside. The number of staircases must not be less than two for every tier, and their width not less than four feet eight inches for every one hundred and fifty persons.

[*London.*] The necessity of providing exits through a common vestibule or crush-room for the better class of people who frequent

The several flights of such steps must be supported and enclosed upon all sides by brick walls not less than nine inches thick, to be carried down to the level of the footways.

No staircase is allowed to have more than two flights of twelve steps each without a turn and all landings are to be six inches thick, square upon plan, and have brick arches nine inches deep turned under them in the middle of the landings.

Every staircase must have a roof of fire-resisting materials to be approved by the Council.

A continuous handrail has to be fixed on both sides of all steps and landings, supported by strong metal brackets built into the wall.

The handrails must be chased into the walls, where the thickness of the walls will permit, but in all cases where the flights of steps return, the newel wall may be chased so as to allow the handrail to turn without projecting on the landing.

[*Austria.*] The staircases in Austria have to be so placed as to be easily found and close to the tiers or galleries. In Italy the rules specify that the steps must be of stone, a bad material to resist fire; but Paris requires solid pugged concrete (*hourdés en pleine maçonnerie*) held together by an iron framework.

[*Paris.*] The width of the staircases in Paris must not be less than four feet ten inches, commencing at its highest level. This width has to be increased in proportion, on each flight, to the number of persons using the staircase. This suggests persons entering the staircase at more than one level, a fatal error in my mind; in fact a further regulation stipulates that every theatre shall have at least two staircases entirely devoted to the use of the audience and independent of each other, and that these staircases shall communicate with each story and lead out into the street.

[*St. Petersburg.*] In strict contradiction of the Paris rule, the St. Petersburg regulation is that staircases for direct communication between the corridors of the tiers, and from the interior of the auditorium to the tiers are not allowable.

Spiral or curved staircases are, of course, inadmissible and the St. Petersburg regulations provide for this as well as the prohibition of intermediate steps in staircases and corridors and threshold steps.

[*New York.*] The openings to the staircases in New York must be equal to the staircases themselves, and although the staircases must, as a rule, be enclosed by brickwork, yet the staircase to the first gallery (or dress circle) may be left open on one side, but in no case may they be left open on both sides. When straight stairs return directly on themselves, a landing of the full width of both flights, without any steps must be provided. Stairs turning at an angle must have a proper landing at the turn, introduced without winders. In staircases where two side flights connect with one main flight, the width of the main flight must be equal to the aggregate width of the side flights.

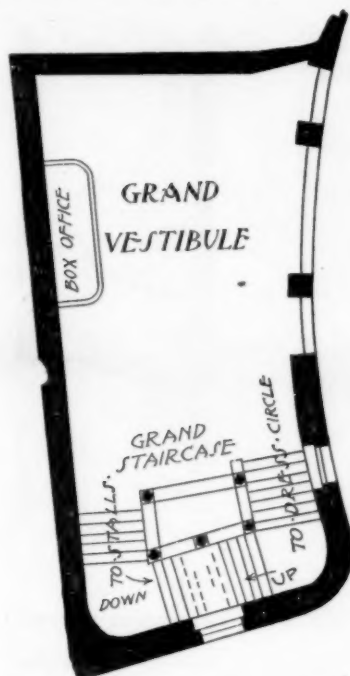
The rise of the steps may be seven and one-half inches and the tread eleven inches in New York. In circular or winding staircases the width of the tread in the narrowest part must not be less than seven inches. Circular staircases are not allowed in London theatres. Handrails are required in all the foreign regulations.

GANGWAYS.

The difference of opinion in different countries as to what the width of the exits should be for any given number of persons in a theatre is certainly very wide, as will also be found to be the case with regard to the gangways in the auditorium. The London rule appears to be behind the time in this respect as it only provides that:

[*London.*] "A clear passage or gangway not less than three feet wide, shall be formed at the sides and in the rear of the seating in every part of such premises, and that such passages or gangways shall at all times be kept entirely free from chairs, flap-seats, or other obstructions, whether permanent or temporary."

[*New York.*] All seats in a New York theatre must be securely fixed to the floor (with the exception of the loose chairs in the private boxes) and no seat in the auditorium may have more than six seats intervening between it and an aisle; all aisles must be twenty-two inches wide for every one hundred persons using them,



Grand Vestibule and Staircase, Royal English [D'Oyly Carte's] Opera-house, London.

theatres and have to wait under cover for their carriages has called forth the following rule of the London County Council governing the width of openings from the vestibule to the street:

"Where vestibules are provided, not more than three tiers or floors (or, where such tiers or floors are divided into two or more parts, such parts of tiers or floors) shall communicate with one vestibule.

"The width of each vestibule shall be at least one-third greater than the united width of all the doorways or passages that lead thereto.

"The united widths of all the doorways or passages that lead from a vestibule towards a thoroughfare or way shall be at least of the same width as such vestibule.

"Not more than one exit from each separate part of a tier or floor shall be used as an entrance."

[*New York.*] Not much is said about vestibules in other countries. New York has a regulation that distinct and separate places of exit and entrance must be provided for each gallery above the first. A common place of exit and entrance may, however, serve for the main floor of the auditorium and the first gallery, provided the capacity be equal to the aggregate capacity of the outlets from the main floor and the said gallery.

[*St. Petersburg.*] The vestibules required in St. Petersburg must be spacious, and surround the *parterre* on three sides, with sufficient number of exits without internal lobbies; but exterior lobbies must be spacious, and not less than seven feet wide. The collective width of the exits on the outside from the vestibule must not be less than four feet eight inches for every one hundred and fifty persons accommodated.

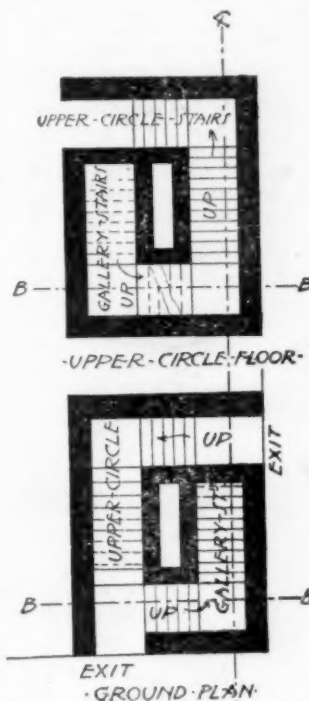
[*Paris.*] In Paris, the total width of the openings communicating from the passages to the vestibule must not be less than nineteen feet seven inches for theatres containing one thousand persons or less. The external doors from the vestibule to the street cannot be less than three in number, with a minimum width of eight feet two inches each. Where a theatre contains more than one thousand persons, 1 foot 11½ inches has to be added to this for every additional one hundred seats.

STAIRCASES.

The rules as to staircases are very numerous and very long, but the London County Council's regulation for the most part embraces all the salient points enforced in other countries.

[*London.*] In London, every staircase for the use of the audience must have solid square (as distinguished from spandrel) steps of York or other stone or fire-resisting materials, to be approved by the Council, with treads not less than eleven inches wide and with risers not more than six inches high, without winders, in flights of not more than twelve nor less than three steps each.

The treads of each flight of steps must be of uniform width, and be pinned into brick walls at both ends.



Plan of Upper Circle and Gallery Staircases within the same Containing Walls.

and in no place shall they be less than three feet and they must increase in width toward the exit, at least one inch for every five running feet or part thereof. This is an excellent rule.

SEATING.

[London.] In accordance with the rules of the London County Council, the area to be assigned to each person in the auditorium, must not be less than one foot, eight inches by one foot, six inches in the gallery, and not less than two feet, four inches by one foot, eight inches in other parts of the theatre. A clear passageway or gangway not less than three feet wide must be formed at the sides and in the rear of the seating in every part of the auditorium, and the gangways at all times kept clear of obstruction.

In looking at the foreign regulations on this point we find that nearly all countries insist upon the gangways being kept clear; it is indeed surprising to read such a rule as the following in the Brussels regulations:

[Brussels.] "No stool may be placed in any gangway without the consent of the local authority. These stools should be of a pattern to be approved, and should fold back in such a manner as not to interfere with the passageway."

[Austria.] Very strict rules as to seats and gangways exist in Austria. The stall seats there must be hinged, having a depth of at least one foot, nine and one-half inches, a width of two feet, three and one-half inches, and a clear space in front of one foot, three and one-half inches. The minimum for numbered seats is one foot, seven and one-half inches by two feet, one and one-half inches, rather less than in England. When the seats in the pit and the galleries of the Austrian theatres are approached from either side, the space between the rows must be four feet, one inch; if only from one side then the rows may be three feet, three inches apart. Cross gangways must divide every six seats, and the exit doors be in line with them. Where, however, this is impossible, a clear space of at least five feet must be left all around between the last row and the wall.

Standing room is permitted in spaces specially set apart for the purpose, in the pit and gallery and may be filled with four persons for every square yard. Drop or movable seats are not allowed.

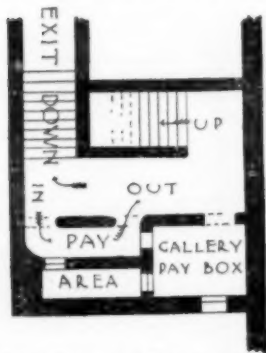
[Austria.] In Austria the theatre is licensed to hold a certain number of persons, and such number, whether in the boxes, stalls, numbered or unnumbered seats, and the spaces for standing, may not be increased on any pretence. This is a wise provision which should be enforced everywhere.

[Brussels.] There is a rule in Brussels which seems almost to contradict the one that has already been quoted, that the chairs and seats, with the exception of those in the private boxes, should be fixed to the floor. There must be at least two lateral gangways and a third one may be required by the authorities. The width of these gangways is rightly determined by the number of people who have to use them, being calculated on a basis of three feet, three inches, for every hundred persons.

[St. Petersburg.] The number of seats in a row without intersecting gangways is limited in St. Petersburg to twelve, with middle passages four feet, eight inches wide and side passages two feet, eleven inches.

[Paris.] Paris seems to be behind in her requirements on this point, as all the seats upon the ground-floor of the auditorium and those of the galleries must be provided with two side gangways not less than three feet, three and one-half inches, unless they have a middle passage, four feet, three and one-half inches wide. The seats of the chairs in Paris have to be constructed so as to fold against the backs.

[New York.] No seat in the auditorium of a New York theatre can have more than six seats intervening between it and an aisle.



Gallery Entrance and Exit, New Theatre, Cranbourne St., London. Spencer Chadwick, Architect.



Pit Entrance and Exit, New Theatre, Cranbourne St., London. Spencer Chadwick, Architect.

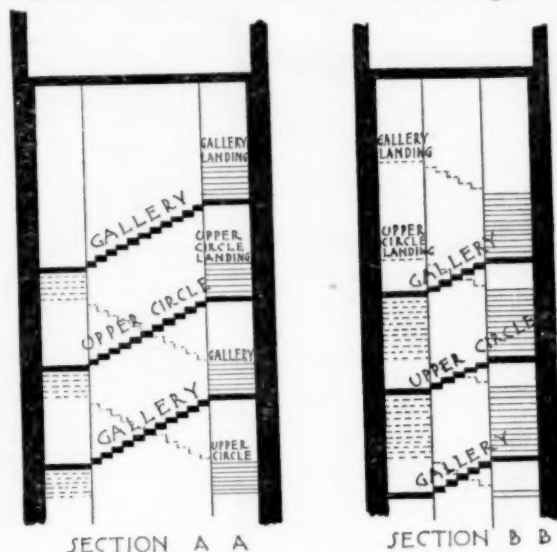
All gangways must be at least twenty-two inches for every one hundred persons, and no aisle can be less than three feet at its narrowest part, and it must increase at the rate of one inch for every five running feet toward the exit.

It will be seen from this that in this particular detail there is much divergency of opinion between the various countries.

SHAFTS AND SKYLIGHTS OVER STAGE.

[London.] We have now to look at the rules for further details in theatres peculiar to that class of building.

The height of the wall-plate carrying the rafters of the roof over the stage in London must not be less than twice the height of the



Sections of Upper Circle and Gallery Staircases within the same Containing Walls.

proscenium-opening, such height being measured from the level of the stage at the curtain line.

An opening for carrying off the fumes and smoke must be formed in the roof near the back of the stage, of a superficial area at the base of at least one-tenth of the superficial area of the stage, said opening has to be covered with a lantern light, glazed on the top and sides, and be fitted with suitable exhaust cowls.

[New York.] A similar rule exists in New York. There a shaft or shafts must be provided over the stage passing through the roof, one-eighth the area of the stage. The shaft must be fitted with skylights having sliding sashes glazed with double-thick sheet-glass, not exceeding one-eighth of an inch in thickness, each pane measuring three hundred square inches. These skylights must open instantly on the cutting or burning of a hemp cord.

[Austria.] Austria also requires a ventilator over the stage, but only one-fortieth the area of the stage floor. The flaps of these ventilators, which must be of iron, are so arranged as to drop by their own weight when released, and are worked in conjunction with the metal curtain.

[St. Petersburg.] The size for the "trap-door" over the stage in St. Petersburg theatres is seven square feet, and it must be easily opened in event of fire from below.

[Brussels.] Brussels does not define the size of the opening or "movable louvres" required.

[Mons.] In order to promote the escape of gas, the Mons Board of Works recommend that English draught-producers or gyrating smoke-dispensers should be placed on the roof, to be closed by "butterfly traps," and to be opened, not only in case of fire, but after shooting, or the burning of Bengal lights, etc., on the stage.

IRONWORK.

[London.] All constructional ironwork in such premises shall be imbedded in fire-resisting materials in a manner to be approved by the Council. This rule needs no comment; the necessity of it is known everywhere.

WORKSHOPS, ETC.

[London.] The Council's new rules as to workshops, stores, etc., are very clear, and, although strict, are not any too stringent. They are that all workshops, storerooms, wardrobe or painting rooms in connection with theatres must be separated from the theatre proper by brick walls not less than nine inches thick.

All scene-docks or stores and property-rooms in connection with the theatre must be enclosed by brick walls not less than nine inches thick, and have floors and ceilings of fire-resisting materials.

All openings in the walls must be closed with self-closing wrought-iron doors hung in wrought iron frames.

All such iron doors, if consisting of a single fold, must be made to overlap the door-frame at least three inches; and, if made in two folds, the folds must overlap each other at least three inches on each side when closed.

All floors and ceilings of workshops, etc., must be formed of fire-resisting materials.

All such rooms must be ventilated by windows in the outer walls.

[Paris.] The Paris rules are similar, for no workshop or store-room may be formed in the auditorium, stage or dependencies; only the scenery and properties necessary for the run of a piece are

allowed to be kept inside the theatre. All storerooms (*lieu de dépôt*) must be separated. No workshop, firework-store (*magasin d'artifice*) or store for any explosive substance whatever is permitted in a theatre. No workshop in a Paris theatre may be let for any business or trade which causes danger from fire, and the flues from such parts of the premises are not allowed to pass through any part of the theatre proper.

[*New York.*] The New York regulation imposes exactly the same restrictions as quoted in the foregoing paragraph, with the exception that the openings from the workshops to the theatres must be closed with wrought-iron doors on each side of the opening; the doors hung to iron eyes built into the walls.

[*London.*] The London County Council's restrictions as to the location of lime-light tanks are as follows:

"All lime-light tanks, boilers with engines and dynamos with engines shall be each placed in a ventilated chamber or building of fireproof construction.

"Such chambers or buildings shall be separated from such premises and from each other by brick walls and fireproof floors without openings, and shall be enclosed upon one or more sides by external walls."

There is no additional information to be gathered from foreign regulations on this point, but there will be much to be said on dynamos, etc., when we come to the rules on electric-lighting.

The following rule appears to be peculiar to London, and is one rather of management than construction:

[*London.*] "No enclosure shall be allowed in any such premises, where the public can assemble for any other purpose than to view the performance, except so far as the Council shall consider necessary for the provision of refreshment-bars, or in the case of a theatre for the provision of a foyer."

[To be continued.]

MUD, A MATERIAL IN PERSIAN AND EASTERN ARCHITECTURE.¹—II.



Fig. 7.

IT was from what I thus chanced to see, even in this desolated region of Persia, that it began to dawn upon me what this peculiar manner of construction really had been. It was the exclusive building material of that part of the world. The simple houses of the villages are formed of it; the defensive walls of the towns, and which, owing to the Turkomans, were an absolute necessity to every village, were constructed of the same. The houses of the rich were also formed with it, and it had been developed into a highly decorative style of architecture; all this grew upon me, and I felt that this peculiar manner of building had not received the attention of writers its merits entitled it to.²

One would not expect much durability from such walls, yet I was informed that there are walls of sun-dried brick in Ispahan which are over three hundred or four hundred years old. This quality of durability will, no doubt, depend upon the character of the soil. About Teheran the earth is sandy, while at Ispahan it is said to be more adhesive. In the northern part of Persia, according to Mr. A. Finn, of the Consular Service, the walls of the old city of Erig are still standing, and they are said to have existed for twelve hundred

years. There still remains at Cacha, in Peru, a wall of *adobes*, or sun-dried bricks, part of the temple of Viracocha, which was in a ruined condition about three centuries ago, when Garcilasco described it, and this wall is still standing to a height of forty feet.³ There are the remains of very old walls in Egypt. Maspero describes one at Abydos, called "Kom-es-Sultan," or "the Mound of the King," an old fortification, where part of the crude brick wall still stands "from twenty-four to thirty-six feet high."⁴ Maspero does not give a precise date, but from what he says I understand that he places the origin of this fortification as far back as the earliest of the dynasties. These examples are sufficient, although others might be cited, to show that mud walls need not be mere things of a day, and that they have in the past endured for centuries. There is a Devonshire saying regarding the "cob," or mud walls, of that locality: "A good hat and a good pair of shoes is all that cob wants." The pair of shoes here meant is a stone foundation such as I have described in the Persian houses; that is, to protect the lower part of the wall; and the hat is a sufficient amount of thatch, or covering, to the top of the wall to save it from the influence of rain. With such conditions, I believe that mud walls in Devon, even in our own damp climate, have stood for long periods of time.

I come now to one very interesting part of the subject connected with this peculiar style of building, and that is to point out a few architectural forms that can be traced back to it. The history of no architecture can be accepted as complete till every form in it has been followed through the past to its first origin. This has been fairly well done in Greek architecture, where the main features of it have been traced back to wooden forms. Many of the details of Egyptian and Indian architecture have also been shown to have had a similar derivation. In these details, the wooden character has been so distinctly continued in the lithic reproductions that the evidence may be considered as complete and reliable. In the material we are now dealing with the forms are not so well defined, and the mutation from one material to another having taken place far back in their history, we have not the same trustworthy evidence to present regarding it. Yet in some points it is fairly good, and in others we have every probability to support them.

The sloping jambs of doors and windows are peculiar to many old styles of architecture, such as the early Greek and Etruscan. Theories of origin for this have been often suggested, but we have no difficulty in accounting for them, if we suppose that the narrowness above was a form, and the natural result of the sloping walls of mud. The wooden parts of the first Greek temples were the portico and the wooden frame to support the roof; the walls of the cella were, in all probability, of crude brick. The late explorations at Olympia have led to an idea, but which still requires further support, that the cella of the Heræum at that place had been constructed of mud. This is the temple of which Pausanias⁵ states that one of its original wooden columns still existed in his time, which is an evidence in itself of its great antiquity.

I have already explained how builders in mud—and which is well exemplified in Persia—construct their walls with a broad base, to give solidity below, and with a marked batter upwards to reduce the weight above. It has been suggested—and, I think, with every reason in its favor—that this explains the very marked slope of the perpendicular lines of the Egyptian pylons. All the authorities agree in stating that in the old temples the outer wall forming the temenos of temples of Egypt was made of crude brick, and, as the pylon was the gate through this wall in front of the temple, the great probability of its being constructed of the same material is obvious.

At one time the Romans were credited with having invented the arch. Later, it was supposed that they only derived it from the Etruscans. At the present day, no one would venture on locating the discovery of this constructive form with any one particular people or country. It is now known to be so old in Egypt that its first beginning there cannot be determined. Vaulted and domed structures, such being principally used for granaries or storehouses, are also very ancient. The same may be said of Mesopotamia. Domed buildings are represented in a sculpture from Kouyundjik. M. Place's excavations at Nineveh show that the palaces there were roofed with vaults of crude brick covered with stucco. Long ago, Mr. Fergusson reasoned out the probability of this from the plans of these buildings. The Chaldeans constructed vaults and domes two or three thousand years before our era; and M. de Sarzec's explorations at Tello have raised the supposition that the Proto-Chaldeans were capable of accomplishing the same kind of roofing for their houses.

When I had seen village after village in Persia with vaulted or domed roofs, and learned that such roofs could be formed without centres, the idea immediately suggested itself that these methods of building had existed from the most primitive times; and this supposition finds strong support from the results of recent explorations in Egypt and Mesopotamia, which have just been referred to. While the necessity for wooden centerings for building vaults and domes was believed in, we never could have credited an early state of civilization with this invention. Let this assumption regarding centres be removed, and the whole problem is changed. The earlier workers in mud or clay could not have been long in discovering how to spread their material over the space enclosed by four walls. They

¹Society of Arts: a paper read before the Applied Art Section, May 17, by William Simpson. Continued from No. 862, page 12.

²It has not been altogether overlooked. I learn that it has been dealt with in more than one work. In M. J. F. Blondel's "*Cours d'Architecture Civil*," Paris, 1777, his editor, Patte, gives a description of the mode of constructing buildings "*toute en terre dite pisé*." It is treated upon in a work published in Berlin, written by H. F. Rödlisch, entitled "*Praktische und Historische Darstellung Erdbaukunst*." There is an article on "*Pisé*" in the "*Dictionary of Architecture*," Arch. Publication Soc. Miss Yule, in "*Murray's Handbook for Greece*," gives some very valuable references to it, and I would refer all who are interested in the subject to look up the "*Quarterly Review*," Vol. LVIII, 1837, for an article "On Cob Walls," by Mr. Richard Ford, the father of Sir Francis Clarke Ford, our ambassador at Constantinople. It is a very learned article, and, at the same time, very amusing. I may also refer to a paper, read by myself to the Royal Institute of British Architects in 1887 on "Mud Architecture," and published in the *Transactions of the Institute* for that year.

³Squier's "*Peru*," p. 407.

⁴"*Egyptian Archaeology*," by G. Maspero, p. 17.

⁵Pausanias, B. v. c. xvi.

would, no doubt, have begun at first with small spaces, and a very little experience would soon have enabled them to deal with greater. If any one considers the matter, I think he must arrive at the conclusion that mud must have been first used for a long period of time before burnt brick came into existence, and now that we know how easy it is to produce a roof with the mud, there is no great improbability in the assumption that the vault or dome, as well as the arch, all date back to a period when that material alone was in use. This also means that it was in a region where wood was scarce, for the existence of wood must have had in itself the tendency to prevent the invention of the vaulted roof. I do not suppose that the vault was invented in one region, and was afterwards carried to another; my idea is that, wherever the conditions that I have described existed, such a mode of producing a roof would be arrived at. Whatever may have been the case, it occurred so far back in the history of our race that I fear the exact date is likely to remain as one we can only speculate upon. My own conclusions, which can pretend to nothing more than that of inferring what may have been probable, is, at least, based on our latest knowledge. Further explorations may give us more light and more certain data to reason upon.

Let me here direct attention to a very important development—in fact, to what might be called a complete change in architecture—which can be traced back to this origin of the arch, the vault and the dome, which have been followed back to their first origin. The origin, I frankly admit, is theoretical, but it is a theory with much in its favor. Greek architecture was what is technically called "trabeate"; that is, with columns supporting a lintel or architrave. This style originated from wood, and was, by means of the conquests of Greece and Rome, largely diffused over the Old World. The change which occurred was that of the pier supplanting the column, of the arch doing duty for the lintel, the vaulted roof and dome at the same time taking the place of the straight-lined roof and pediment. This important change in architecture was, in fact, nothing less than the forms of mud origin supplanting those forms that had been derived from wood. The style to which this mutation is attributed is that known as the Sassanian, which belongs to the period when the dynasty of that name ruled in Mesopotamia. There are very few remains of this architecture left,¹ but in these few we find the arch, the vault and the dome combined into a full-grown architectural style. The rise of Byzantine architecture may have been independent, but it was nearly contemporaneous with the other, and was probably influenced by it. When the Mohammedans destroyed the Sassanian power they seem to have adopted the architecture, for the arch and the dome became the principal features of the Saracenic style, which they carried westward to the shores of the Atlantic and into Spain.

Not only did this style influence the architecture westward, but I am now in a position which enables me to trace it eastwards as well. Major Talbot, R. E., one of the officers on the Survey Department with the Afghan Boundary Commission, chanced to visit a place called Haibak, which is on the main road from Kabul to Central Asia; it is to the eastward, and not very far distant from the site of the ancient city of Balkh. There are numerous caves in the locality, and as they are near to Bamian, with its city of caverns, their Buddhist character may be assumed. Major Talbot luckily made very careful plans and sections of one group, known as the "Stables of Rustem." These he sent home to me, and, on inspecting them, I found that some of these caves had domes excavated in the rock, and that they were imitations of constructed domes. But more than this: I saw that the domes were the same in form as the few still remaining to represent what Sassanian architecture had been. One of the details which fully determines this is the pendentive, by which the square form of the plan is converted into the round as the base of the dome. These are exactly the same in the Haibak caves as in the Sassanian domes. Major Talbot, by good luck, sent me a sketch of a pendentive in one of the Bamian caves, and it is similar to the others, showing that the Haibak examples were not exceptional. As these domes were exact copies of structural ones, they prove most distinctly that the Sassanian style was not limited to Mesopotamia, but must have extended eastward all through Persia and Khorassan to Central Asia. This discovery necessarily gives a new value to the Sassanian mode of construction, which has been known up to the present from about only half-a-dozen ruined monuments that have been left to us. A question is opened up by this new aspect of the case: that is, did this style first originate on the banks of the Euphrates or in Central Asia, both of them mud-building regions? This cannot be answered at present. The great probability is that it might have been contemporaneous along the whole region. Now that we know the Sassanian style existed so far east, it becomes evident that it was the architecture carried at a later date by the Mohammedans to Afghanistan and also into India, where it became the parent of the Mohammedan style in that country, and produced those beautiful musjids and tombs at Delhi and Agra which command the admiration of all that are lucky enough to behold them.

I have described the foundations of a mud wall, such as they are in Persia, formed of burnt bricks or stones and lime, and also in Devonshire, where they are known as a "good pair of shoes," because they protect the feet, or lower part of the wall. In the remains of the

temple of Viracocha, in Peru, the mud walls there have a stone base eight feet in height. With these examples before us, and understanding the necessary purposes they served, we may assume that such protective substructures were generally employed wherever this particular manner of building was in use. It is highly probable that in this rude constructive detail we have the first origin of that part of the architecture in the palaces of Assyria to which the great winged bulls in the British Museum belonged. It seems now to be accepted that these palaces were constructed of crude brick, or, at least, this material was the principal one employed; baked, or perhaps glazed brick, may have been used in the exterior of the walls, but the interior was of sun-dried brick, and covered with stucco. This latter part is exactly what I saw in Persia, and have already described in this paper. Along the base of these walls slabs of marble were placed, varying from three to about eight feet in height. These were generally sculptured, and the great bulls were represented on the portions of the slabs on each side of the doors. The development of this highly ornamental dado in the palace from the base to the mud wall is not a difficult problem to solve. The foundations I saw in the villages were formed of stones, half-bricks or rubbish of any kind. In the better class of houses a more regular construction would be followed, and in palaces the covering of this with marble is what might be expected. I accompanied a visit of ceremony to the palace of one of the Shah's sons in Teheran, and I noticed that, in the room where we were received, slabs of alabaster about three feet in height went all round the base of the walls. These alabaster slabs in Persia are the counterpart of the marbles in the palaces of Assyria. In both cases they served the same purpose: they protected the lower part of the walls.

It is not so long ago, in this country, that the dado commanded a large amount of what, at the time, was known as an æsthetic devotion. From the interest then produced, I feel justified in pointing out that here I have given the origin of at least one dado, and that a very important one, as the sculptures in the British Museum make evident.

I am inclined to suppose that the old masonry which we recognize under the word "cyclopean," which is known to all who have any familiarity with the archaeology of Greece, had its first origin as the base of mud walls. No direct evidence exists on which to ground this supposition, and I only present it here as a mere guess. We do know that Greek towns were at an early period defended by mud walls. In 385 B. C., Agesipolis, King of the Spartans, managed to take the city of Mantinea by damming up the river till its waters reached the base of the mud walls, which fell down as soon as their lower part was softened. Pausanias, writing of this siege, declares that such walls were in one respect better than stone: "Though a wall of this kind," he says, "stands the shock of warlike engines, and is a better defence than a wall of stone [for stones are broken in pieces, and leap from their places, through the force of these engines], yet it is dissolved by water no less than wax by the sun."² As an evidence that mud walls of cities in ancient Greece were not exceptional, Pausanias may again be quoted. He says that, regarding the method by which Mantinea fell, that "Agesipolis was not the inventor of this stratagem, but it was employed prior to him by Cimon, the son of Miltiades, when he besieged Eion, near the river Strymon."³ These references show not only that mud walls were common, but that, for security, a "good pair of shoes" was an absolute necessity in that early period, when cyclopean masonry was practised. This suggestion first occurred to me from Squier's description of the Temple of Viracocha, where the old wall of adobes stands on a base of cyclopean masonry 8 feet high and 5½ feet thick.

It was a source of some surprise to me to find that the Persian villages were, as a rule, exactly similar to those I had seen in the Khyber Pass and other parts of Afghanistan. They are square, formed with four high crenelated walls, and a round tower at each corner. The gateway is in the centre of one of the walls, and the mud houses are huddled together inside, one might say "anyhow." Larger villages may have six or eight towers; small towns or large ones have more wall, and a larger number of towers. One of the first things that drew my attention to mud as a building material in Persia was, when in passing a small town one morning on the march, I saw some men either building or repairing the walls and towers of the place. It then struck me that these defensive walls were, with only some trifling details of difference, almost identical with the walls we are so familiar with on the Assyrian sculptures. There is the same repetition of crenelated wall and tower, and constructed of the same material. I said to myself "these men, in the present day, are building an old Assyrian wall of fortification." Such defences must have begun at a very early date in Mesopotamia, long before the sculptures were produced from which we know what they were in appearance, and their construction has never ceased from that to our own time. This presents a very striking illustration of the continuity of type; and I confess that the discovery produced at the moment a very strong impression upon my mind.

About one hundred miles east of Teheran there is a curious village called Lasgird⁴ (Fig. 6). It is supposed to be very old, and its

² Pausanias, B. viii, c. xviii.

³ Ibid.

⁴ Gird in this word is said to have the same signification as "girdle" in English—which may be rendered as "circle." (This block has been kindly lent by the Editor of the Illustrated London News.)

¹ Among the few may be mentioned the Takht-i-Khosru at Ctesiphon and the palaces at Feruzbad and Sarvistan.

circular plan is said to have been first drawn on the ground by Las, the son of Noah. Not having heard of this personage before, I have been looking out for some reference to this member of Noah's family, but up to the present without success. The statement has already been made that the villages in Persia are square; such is the rule, and it will explain so far how a round one in their midst appears as something strange and remarkable. Imagine a huge rough cylinder of mud standing up, perhaps thirty feet or more in height, and covering a space about the size of that enclosed by the railings of Leicester Square. (These are only eye guesses as to dimensions.) This great circular wall is so massive, that the houses of the people are constructed on the top of it, and form in a rather irregular manner two stories. There are rude balconies, or I ought to say narrow ledges, on the outside which form communications. These are made of untrimmed branches of trees interlaced with twigs, on which mud is laid, but without a protective railing of any kind. Goats which I saw on these frail and dilapidated ledges were safe enough; but children, whom I also noticed at play on them, seemed doomed sooner or later to certain destruction. The interior space formed by the circular wall is filled with store-rooms and places where the cattle can be safely housed in case of an attack from the Turkomans. The only entrance into this strange structure is by a small opening about four feet by three, which can be closed by a stone door turning on pivots. The smallness of this doorway was intended to prevent raiding enemies from entering during the chances of a rush, for it would be necessary to keep it open to the last moment to admit those of the villagers who were running home for protection. I noticed small stone doors in many places, and the purpose they served was that they could not be destroyed by fire; the raiders had no time for regular siege operations. They made a rush upon a village, and caught all, man or beast, that were unlucky enough to fail in reaching the shelter of their mud walls.

I have dealt with this building material in the past; regarding its future I can say but little. In England here it was largely in use, so was wood, and that which is well expressed by the words "wattle and dab," which might be described as a combination of wood and mud. All these, as our material conditions have improved, have been slowly supplanted by the burnt brick or stone. "Cob" is still in use, to a limited extent only, in North Devon. It may be assumed that it is not suited for our damp climate. In dry climates, such as Persia and Egypt, it is likely to continue, for the simple reasons that it is a cheap material, and that a comfortable dwelling can be made from it. It might be utilized by some of our emigrants. Australia is reputed to be a dry country, and it might be employed by first settlers, particularly where wood is scarce. An emigrant, if he had a few hints and suggestions to start with, could easily construct a house for himself, and it would have one great advantage over a wooden house—it could not be burnt down. I have already mentioned in this paper how an officer at Jellalabad made a very comfortable hut for himself. What he did there an emigrant might easily do in Australia. The non-inflammable character of mud ought to be a strong recommendation to it in many parts of the country. I might mention a country like California as one where this material might be valuable. California has a dry climate. When I was in San Francisco, in 1873, that town was almost wholly constructed of wood. Stone was feared owing to the chances of earthquakes. While there, I visited the Church of St. Francis built of adobes a century before, and it had stood firm and secure all that time. It occurs to me—but I have no right to speak as an expert—that a house built of thick mud walls and wooden joists and rafters, would be tolerably safe during an earthquake, unless it was a very severe shock; such a house would also be safer than a wooden one from fire, which has always been a great danger in San Francisco. I have only referred to California as an example; what has been said of it will apply to many other parts of the world, where it is possible this material might be used with advantage even in our own day.

A MODERN HOUSE AT BARCELONA.



It is believed that there is not a European city of its size possessing so many new, large and beautiful residential mansions as the second city of Spain—Barcelona. When at Monte Carlo, the writer thought that for modern "chic" the villas on that part of the petty Monaco promontory would beat any other Mediterranean locality. The variety and beauty of the modestly-small houses in that particular portion of southern France was an agreeable surprise. But after seeing a deal more of the continent and peninsula, he arrived in the capital of Cataluña, and visiting the transformed and reformed districts of the city, it almost caused astonishment to see the progress which had been made in the raising of vast and noble edifices. It would seem as if an exodus of Spanish millionaires—in millions of pesetas, or francs—had set in, coming from

other towns and provinces of Iberia to settle in Barcelona and build their retiring homes there. Whatever be the cause, certain it is that the professions of architects and builders must be busy-enough ones, and give constant employment to thousands of workmen.

As the commercial capital of Spain, it is fair to assume that its architectural interests, and the actual condition thereof, may be gauged in Barcelona. For the taking of a retrospective view of the art in Spain, there is no better compact field, especially if the student be limited in time. To converse with its professional members—"masters-of-works" (literal rendering of *maestros-de-obras*)—be taken over and shown with pride their latest achievements in constructions under their supervision, visit their technical associations, etc.,—all this will go towards giving a good idea of the present state of architectural matters in the Castile of to-day. I have covered the ground indicated more than once, know the subject, and can counsel others of an inquiring mind, on travel and inspection bent, to follow the same route.

Of all the remarkable modern edifices in the Catalan capital the features of attraction and noteworthiness centres in that of a too-wealthy Señor Guell, on the Calle Asalto. It is of no style of architecture, being the production of the joint ideas of the architect A. Gaudí, and the proprietor. It is virtually a pile of stone and massive ornamental iron-work. In fact, the amount of iron profusely lavished on and over the two gateways, at the windows—there are four floors, lofty rooms—and all about the façade generally, is the chief feature of mark. A phoenix rises above the centre column facing the street, moulded in all the jealous vigor and daring of the American eagle, or the Andes bird of freedom. There is no knowing what this residence cost Señor Guell; the large sums have not been totaled up; the architect says even he does not know. Five years were steadily and uninterruptedly consumed in building it, and workmen are still busy on parts of minor importance.

Most unfortunately, a view of the front could not be procured. The façade has not been photographed because the building is located on a rather narrow street in the centre of the city. However, this may be possible later on. But views were obtainable of the roof and part of the upper stages, and also of the greater lower portion of the iron-bound rear of the premises, which will serve as an index of what the other sides are like. One view, taken from inside the gates, gives a small idea of the ornamental fixtures and scrolls put thereon.

It will often be remarked by the tourist on the peninsula that stone houses, when being built, have the sides which will be exposed and blank substituted by brick. This is subsequently covered with cement, and thereon will be durably painted a gigantic forest scene in variegated colors. This is an agreeable relief to the eye. For in Spain nothing is considered so distressing an eyesore to a pretentious building as the glaring (or maybe dull) vacant space of a blank wall.

One of the views gives a partial representation of the massive wood cornices and flowered walls in one of the grand salons, reproducing also two paintings. That on the right is a faithful portrait of the proprietor, Señor Guell, when a few years younger. In the different rooms of this private palace, the carved ceilings, in different woods, are especially worthy of notice.

Not all the photographs procurable are now sent, but only half-a-dozen, which will sufficiently serve their purpose to demonstrate the present-day aspect and advance of matters professional in the chief industrial city of the Iberian peninsula—well representative of it commercially and (intellectually) politically. L'A.

BURNT-CLAY MORTAR IN ITALY.—The United States Consul at Catania, in his last report, says that visitors at Catania invariably notice and remark on the peculiar soft pink color of all the unpainted buildings. This coloring is the result of using cement or mortar of proved value, found in the vicinity, and which is nothing more nor less than burnt clay. In the frequent eruptions of Mount Etna in times past great beds of clay were covered and buried from 20 to 200 feet by the lava streams, with the result, when the eruption happened in the dry season, of burning and converting these clay beds into a fine red gravel or powder. These deposits are mined, and are considered very valuable. The material, mixed with a little lime and the usual amount of water, forms a mortar or cement considered superior to any other cement for building purposes, and has been used in Catania to the exclusion of all other materials for centuries. Every building in Catania is constructed of lava liberally cemented with this mortar. In building, small irregular stones are used just as they happen to come, and a smooth surface is afterwards given by a thin coating of mortar, inside and out, which can then be divided by a trowel to imitate blocks of stone, if desired. This burnt clay, with lime, makes a very strong and adhesive mortar; no other material would hold together the large four and six-story apartment-houses, which are built entirely of small irregular stones. It also has unequalled wearing and resisting power, as the extensive harbor breakwater proves. This breakwater was built some ten years ago, and extends for three-quarters of a mile out into the sea, and is said to be as good to-day as when first built. It is composed entirely of lava, and for a foot below water-mark to a sufficient height to protect the shipping, of huge blocks of small lava rubble liberally cemented with the mortar. The constant wear and tear of the sea for ten years has only damaged the cement in insignificant places, and probably only where there happened to be an air-space between the mortar and stones caused by faulty construction of the blocks. Consul Heath adds that the more he looks into the matter the more he is convinced of the value of this mortar as an economic substitute for all the high-priced hydraulic cements now used, and that it might well be adopted in other countries besides Italy. — *Clay-Worker*.

¹ The stone doors which are found so plentiful in the Hauran are formed after a wooden model, implying that wood had been the material at one time. The purpose of the stone doors in Persia makes it probable that a change at one period had taken place in the Hauran: unsettled times had come, and the doors had to be changed from wood to stone, to prevent burning, and thus give safety from sudden attacks.

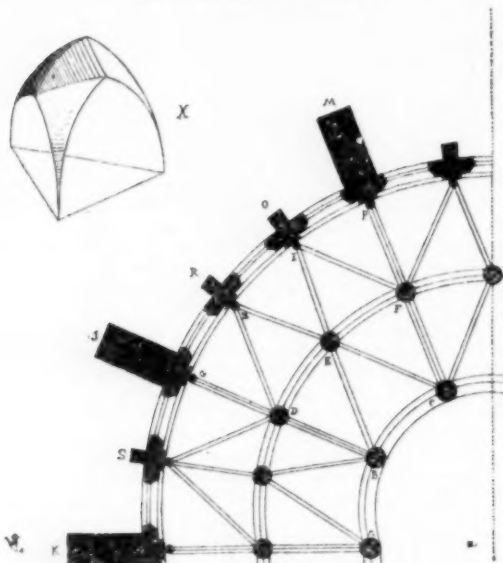
CONSTRUCTION.¹—X.

Fig. 44.

THE builders of that time experimented incessantly, and routine gained no hold upon them. In experimenting, they discovered, they went forward and never said "We are at the goal, let us stop here." This, it seems to us, is a sufficiently good doctrine to follow. We to-day wish an architecture for our own time, a new architecture; it is very well to wish it. But we must know how to find a new architecture. It is not to be done, apparently, by forbidding the study of that art which is most fertile in resources of all kinds, most supple and most free in the use of material means.

Nevertheless a difficulty arose, serious enough and wholly new, when they came to the vaults of double aisles surrounding chancels of great extent. The examples that we have just given belong wholly to edifices of moderate dimensions, and we see that at Saint Remy of Rheims, and in the Church of Notre Dame at Châlons for instance, the outer boundary contains a greater number of supports, than the one within, in order to avoid too great openings between the arches.

In a choir like that of the cathedral of Paris, surrounded by double aisles, it was necessary to arrange the piers in such a manner as to make the openings of the transverse arches nearly equal, in order to obtain vaults whose keys should all reach the same level. The two outer boundaries ought, then, to contain a greater number of piers than the boundary of the chancel. In the cathedral of Paris, in fact, we see (Fig. 44), that the circular part of the chancel, built about 1165, rests upon six piers, while the second boundary contains eleven, and the third fourteen. Thanks to that arrangement the archivolt *A B*, *B C*, etc., the transverse arches *D E*, *E F*, etc., *G H*, *H I*, *I P*, etc., are fixed on almost equal diameters, and the vaults connecting these arches are composed, in order to carry the stone-filling, of only the simple diagonal arches *B E*, *E C*, *F I*, *I E*, *E H*, *H D*, and no longer of intersecting arches.

In the gallery of the first story the same system of vaults is used, and repeats the plan of the first boundary.

Figure *X* gives the form of these vaults raised over the horizontal triangular plan.

The large supports *K L M*, alone maintain the stability of the edifice; they receive the flying-buttresses of the gallery on the first story, tied from *G* to *D*, and from *P* to *F*, etc. As to the thrusts of the two diagonals, *B E* and *C E*, of the vault of that gallery, they are resisted by two little flying-buttresses stretched from *I* to *E*, and from *H* to *E*. So that the principal thrusts and weights are thrown upon the large outer piers *K L M*, and the secondary thrusts and weights upon the intermediate exterior piers *O R S*.²



Fig. 45.

In the interior, monocylindrical columns alone support, on the ground-floor, this vast, tall edifice and rather complicated in the combination of its vaults. There is no need of being very expert in architecture to recognize, by merely glancing at Figure 44, that the evident intention of the master-builder was to occupy with his supports as little space as possible in the interior, and that he tried at the same time to cover the two aisles, by vaults whose summits

should all be on the same level, in order to be able to place upon these vaults the floor of a gallery and flagging having a regular slope toward the outer perimeter.

A little after the building of that apse, the constructors, however, brought the piers *A*, *B*, *C*, nearer together, in such a way as to obtain around the chancel narrower divisions than those parallel to the axis, and they made the archivolt *A B* and *B C* still higher; but we must recognize that there is in the arrangement of the circular space in Notre Dame at Paris an amplitude and freedom of conception very attractive to us.

The vaults are skilfully fixed on these piers, whose number increases at every boundary-line. This is easily done without effort and without experiment. Let us notice also that the Gothic vaults alone permitted the use of this method, and that the first architects who applied it in their building were at once able to reap its full benefit.

In the course of twenty-five years the architects of the end of the twelfth century had arrived at the results which had occupied their

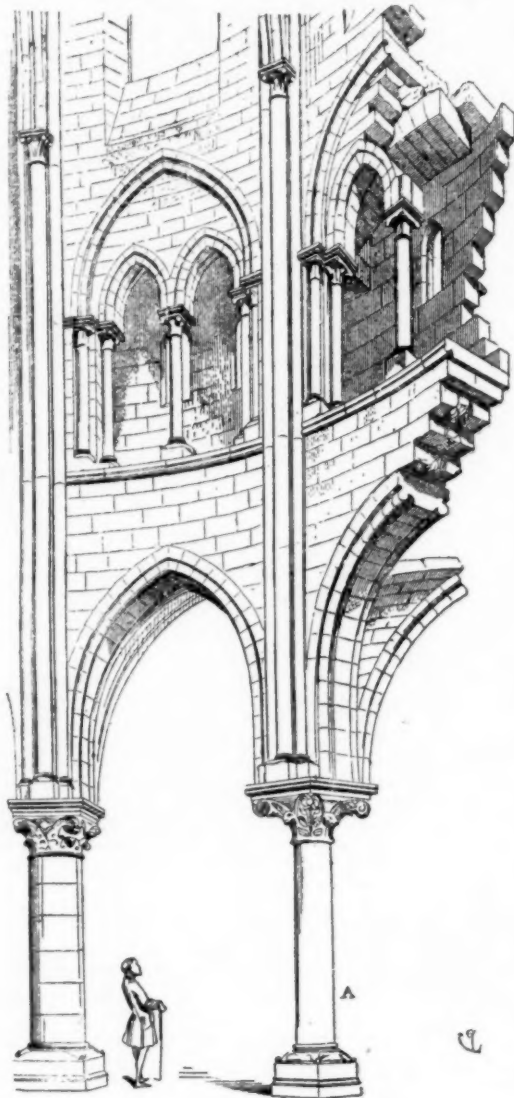


Fig. 45b.

predecessors during the Romanesque period, namely: the vaulting of large and high buildings, while retaining within only slender supports. The triumph of the construction balanced by the opposition of thrusts and the addition of weights above, reducing these thrusts to a vertical action was then complete; and it remained only to simplify and perfect the means of execution. This was done by the builders of the thirteenth century, often with too great boldness and reliance on their principle of equilibrium, but always with intelligence. It was evident that sagacity was the dominant quality of the apostles of the new school. Their efforts tended unceasingly towards excelling the preceding work, toward carrying the consequences of the conceded principle even to abuse; so much so, indeed, that there was a reaction during the fourteenth century, and the buildings where the problems of equilibrium are solved with the greatest boldness are those which were erected during the latter half of the thirteenth century. We shall have occasion to return to this fact.

¹ From the "Dictionnaire raisonné de l'Architecture Française," by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 859, page 165.

² It is understood that we are speaking here only of the early construction of the choir of Notre Dame at Paris, before the radiating chapels.

If one wishes to determine the utmost limit to which the architects at the end of the twelfth century arrived, in the matter of lightness of interior supports, and stability obtained by means of the equilibrium of opposing forces, he must visit the chancel in the church of Saint Leu of Esserent (Oise).

Certain parts of this building, raised about 1190, are calculated to arouse our astonishment. This chancel is composed, in circular form, of four monolithic columns, two thick and two slender, arranged as in Figure 45.

The two columns *A* are only 50 centimetres in diameter, those at *B* being about 85 centimetres.

A perspective view of the two bays upon a circular plan, and resting on the columns *A* (Fig. 45b), clearly shows us after what we have just said, that the builders then relied only upon the equilibrium of acting and resisting forces, in order to sustain such a mass upon so slender a support.

We notice the column *A*, 50 centimetres in diameter, crowned by an extremely broad capital (see *Chapiteau*, Fig. 21), on which rest a powerful skew-back and the three monolithic pillars carrying the extremities of the upper vaults.

The skew-back is broad enough to receive the pier of the triforium and the wall which encloses it.

The exterior flying-buttress pushes the whole construction from without inwards, and the more the flying-buttress bears upon the top of the pier, the firmer footing does the construction obtain.

The enormous weight that the column *A* receives vertically, ensures its stability. The equilibrium cannot be broken, and, in fact, this apse has undergone no movement.

In Ile-de-France, however, the architects were able to keep within a certain limit, and never fell into the exaggerations so frequent among the architects of Champagne and Burgundy. Among the latter these exaggerations were justified up to a certain point by the excellent quality of the materials of that province, and the Burgundian architects, trusting to the extraordinary resistance of their stones, produced works of great importance from the builder's point of view, in that they show us how far the application of the Gothic principle can go when matter comes to its aid.

The vault being henceforth the generator of all the parts of vaulted edifices, and governing the size, form, and arrangement of the supports, it is this that we ought scrupulously to study first.

For one who understands clearly the structure of the Gothic vault, and the infinite resources that its construction presents, all

going farther, the different means used to close the Gothic vaults are completely shown.

Figures 27, 28, 28b and 29 show how the lower beds of the abutments of arches on the abacus of the capital are drawn, and how these lower beds govern the form of the abacus and the position of the pillars and supports.

One easily recognizes that in the first designs of Gothic vaults the builders have avoided, as far as possible, letting the arches intersect

one another at their origin; they had each voussoir cut out according to the section given to each of the arches, and they tried to arrange them as best they could upon the abacus, trimming them off at the end to adapt their form to the intersections. Thus, for instance, having outlined upon the abacus of the capitals designed to receive a transverse arch, two pointed arches, and the two pillars carrying the wall-arches, the bed of these different members, they fixed the voussoirs of each of these arches and the bases of the pillars as seen in Figure 46, cutting off the corners if necessary of the extremities of these arches, as seen at *A*, in order to place them side by side and fit them into their proper bed. This naive method required on the part of the designer no special plan for the abutment, but it demanded a large enough space on the abacus not to reduce too much the ends of the voussoirs, and hence very broad capitals; furthermore it had the disadvantage of giving only skew-backs without resistance, which might give way under their load, and extend the effects of the thrusts still farther, or bring their resultant near the outer facings. Given three arches to establish, the most natural idea was to allow them each a skew-back. But in certain cases the early Gothic builders had been forced, however, to permit the intersection of the different arches sustaining a vault upon a single isolated column, as seen in Figure 42, and to give only one skew-back for all of them; for upon these narrow imposts it was no

longer possible of arranging the first voussoirs of these arches as one puts together the pieces in a game of patience; that would be making these first voussoirs into a conglomeration of angles without force of resistance. Moreover, it was necessary that the first voussoirs of these arches (if they had an upper pier to support), should serve as a base, or, in other words, present actual horizontal courses, in order to resist the pressure.

Let, for instance (Fig. 46b) be a pier, *A*, having an upper pier, *B*, to support above a vault, *C*.

If the arches of this vault are all independent of their origin and have a complete extrados, and if the joints of the first voussoirs are normal to the curves, it is clear that the pier *B* will not rest upon the impost *E F*, as it ought, but upon the slight filling *G*, and, accordingly, its stability cannot be assured, while the pressure upon the back of the first voussoirs will inevitably cause disorder, rupture and downfall. Nevertheless, this was the method employed by the last Romanesque architects, and it often had disastrous results. In similar cases the early Gothic architects proceeded differently.

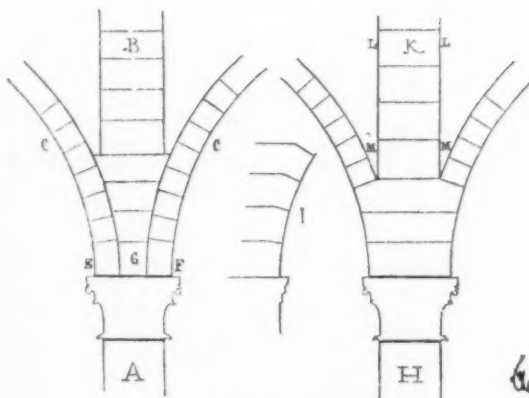
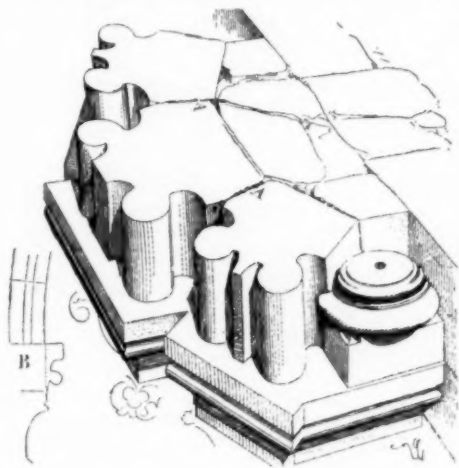
If *H* be the pier bearing an upper load, *K*, they placed as many horizontal skewbacks, one upon another, as were necessary to give the verticals *L* and *M* an impost, and began the arching of the voussoirs normal to the curves only when these curves left the vertical surfaces *L M*.

Up to a certain height, then, the arches consisted of a series of courses with horizontal beds, and serving as corbels.

These builders had too much good sense to think of the ancones *I*, which can never be well arranged, and whose beds cannot be perfectly filled with mortar, and they preferred to adopt the corbels out and out. These had a further advantage, in that they partly destroyed the effects of the thrusts. We should not fail to say here that the face of the voussoirs, or skew-backs, is always set perpendicular to the upper surface of the corbel on the capital, as the drawing *B*, Figure 46, indicates; while as to the base of the pillar carrying the wall-arch, it is set close to the edge of the abacus, in order that the surface of the column may keep perpendicular to the surface of the corbel of the capital. (See the same, Fig. 46.)

From the time when it was admitted that one could place at the starting-point of vaults a series of skew-backs with horizontal beds for superimposed arches, architects no longer needed to spend their time in finding a broad enough surface on the abacus of capitals to receive the voussoirs of several adjoining arches, but only to arrange that these arches should intersect upon the smallest possible surface.

Always rigidly following out their courses of reasoning, they recognized alike that the resistance of arches in the vault system newly adopted is dependent on the height of the voussoirs, and not on their breadth, and that, with sections equal as to area, a voussoir



Figs. 46 and 46b.

the other parts of the masonry are naturally deduced. Our readers have already been able to gain acquaintance with the elements of vault-building; it remains to examine the details, the varieties and the improvements, for we cannot make ourselves clear unless, before

made, for example, as indicated in *A* (Fig. 47) would resist pressure much more than a voussoir made according to the outline *B*. Now, toward the beginning of the second-half of the twelfth century, the voussoirs of arches were generally included in a square section *C*, from eight inches (22 centimetres) to a foot or eighteen inches (33 centimetres to 50 centimetres) in the depth, according to the breadth of the vault, while, toward the end of that century, if the voussoirs of transverse arches still kept that section, those of pointed arches (arches whose diameter is much greater still, but which do not have to resist the pressure of the flying-buttress) lost a part of their breadth while preserving their depth, as seen in *D*. Having less breadth from *E* to *F*, their outline upon the abacus of the capitals took less space and required less width, while adapting itself better to the intersections, and having no more than one edge at *G*, or a simple roll, its sloping projection upon the abacus did not present the awkward and troublesome surfaces given by the arches whose section was *C*.

Little by little, the architects renounced that section *C*, even for transverse arches, and adopted sections analogous to that at *H*, offering in the same way from *I* to *K* a great vertical resistance, and from *L* to *M* a sufficient resistance of base to avoid the torsion already maintained by the filling of the vault.

Thus each day, or rather after each attempt, the architects arrived at the suppression of everything not absolutely indispensable to the solidity of the vaults, and abandoned the last Romanesque traditions in order to obtain:

1. Increased lightness of structure.

2. Facilities for laying the skew-backs, since these skew-backs were henceforth to govern the construction of the piers, and hence of all the lower members of the edifices.

But we are obliged, at the risk of seeming tedious in our explanation of the Gothic system of vaults, to proceed like the builders of that time and to follow, without leaving it for an instant, the march of their progress.

When these builders had admitted the flying-buttress, that is to say, a resistance opposed at certain points to the thrusts of the vaults, it was necessary to unite these thrusts and cause their resultant to act only just upon these isolated points. Hence it was of the utmost importance that the transverse and the pointed arches should intersect in such a way that: First, the resultant of their thrusts should be converted into a single pressure at the point where the top of the flying-buttress touched; Second, that no portion of the thrust might be able to act without, or by the side of that resultant; in a word, so that the collection of thrusts might be directed accurately in one and the same line of pressure at the moment of meeting the flying-buttress as an obstacle.

Vaults whose skew-backs were arranged according to Figure 46, could not attain this result absolutely, for their thrusts must be and, in fact, are scattered, and do not exactly unite in a resultant whose direction and strength can be exactly determined. But if, instead of these first voussoirs set with indifferent success beside one another on the abaci of the capitals, and occupying a broad surface but without any solidarity among them, we suppose a skew-back made in a single course, and if we arrange the starting-point of the arches in such a way that they will entirely intersect and make one single abutment instead of three, we shall have taken a step forward, for the resultant of the different pressures will act upon a single piece of stone, which alone will need to be made immovable. But if, again, not content with this first result, having crowded the starting-points of our arches into as small a group as possible, we consider the skew-backs only as corbel courses, and if we should place several of these courses or skew-backs one upon another with their beds horizontal until the development of the curves of each of these arches permits us to disengage their voussoirs from that mass at the base of operations, then we shall be certain of having at the base of our vaults a resultant of pressures acting along a line whose point of departure, strength and direction we cannot precisely estimate; furthermore, we shall feel assured that the top of the flying-buttress will rest, not upon a masonry without unity and without strength, but against a rigid construction presenting a homogeneous surface, as would be the piece of timber against which one rests the end of a prop. But we have made progress; in the first place, we have recognized that the pointed arch vaults with two compartments, that is to say, upon a square plan whose diagonals are cut by an intermediate transverse arch, oblige us to give to the vaults a very convex shape, which makes it hard for us to lay the centering; for the diagonals of the square being much longer than one of its sides, these diagonals, serving as diameters for the pointed arches, raise their key-stones above the plane of starting to a height equal to half this diameter (see Figs. 20, 20b and 21), a height that the key of our transverse arches cannot attain, unless these arches be made very acute.

(To be continued.)

CHICAGO'S WATER TUNNEL FINISHED.—The great eight-foot water tunnel, extending four miles out under Lake Michigan at a depth of eighty feet has been completed. It was begun over four years ago, and has cost over \$1,100,000. When connected with the water-works pumps it will supply 130,000,000 gallons of water a day to the city, bringing the total available supply up to 300,000,000 gallons daily. Not only the quantity but the quality of the water-supply will be greatly improved. — *New York Times*, June 23.

BOOKS PAPERS

COMMERCIALLY speaking, it is unfortunate that there should be offered at nearly the same moment, for the absorption of architects, two collections of photographic reproductions of colonial architecture as it now appears in the Old Dominion—the more unfortunate in that having traversed essentially the same route, the same subjects have attracted the notice of the two compilers, with the result that in a certain degree the plates in one collection are duplicated in the other. But although there is a duplication of subject, there is not complete identity of presentation, even in those cases where one would look for it. Thus, in the case of the door-head of an interior doorway in "White Hall," Mr. Chandler chose to show the right-hand corner, while Messrs. Corner and Soderholtz, by happy inspiration, pointed their camera at the opposite side. Again, in the case of the Chase house at Annapolis, each party desired to show the upper hall from the landing at the top of the first run, but one chose to show the left one of the two upper runs, while the other party chose the right-hand, and so it goes through the score or so of plates which show duplicated subjects, the duplication being such that one does not repeat so much as supplement the other. In other words, if the sizes of the plates of one collection and of the other had been identical, the two sets of plates might have been shuffled together with, as a result, a very complete record of some of the buildings whose different parts are now divided between two portfolios.

It is an advantage to the last comers, Messrs. Corner and Soderholtz, (though really theirs is the elder undertaking) that, as a rule, their negatives have been sharper and the resulting prints clearer in detail than were Mr. Chandler's, and they gain somewhat in scale; at the same time, they have in some cases fully as much of the soft indefinite sketchiness which made some of Mr. Chandler's plates so charming. One of these is so enticing that it will be curious if half the purchasers of the book¹ do not sit down and make a water-color of it: these two plain brick piers of the gateway at Westover are as attractive a study of accidental light and shade as adept or tyro could wish for.

One of the useful results accomplished by such efforts as these young men have made is the preserving of historical architectural records, and there is no telling how soon some of the buildings shown may have passed out of existence and left only these plates as evidence of their existence. In fact, one of the buildings, one of fair but not great antiquity—great as dates go in American history—is already seriously threatened. It appears that the house built in 1770 at Annapolis by Judge Samuel Chase—one of the signers of the Declaration of Independence—was some years ago bequeathed by the last female holder of the estate in trust for use as a home for indigent ladies of the Episcopal communion, but, woman-like, the testatrix forgot that her charity could not sustain itself, and forgot to provide an endowment. The result is, that howsoever the indigent ladies may have fared, the house has already suffered, and, we believe, is already the object of certain chancery proceedings; and, as Dickens has shown how property and persons mildew and waste away under the gentle inertia of chancellors and their red-tape formalism, it may come to pass that Annapolis will some day awake to the loss of a very interesting mansion.

These two collections in combination show the Chase house in fair completeness, but it is curious that in neither of them is given any explanation of the manner in which the staircase is constructed. In the first place, the arrangement is unusual: a first run of eleven steps starts on the axis of the lower hall and rises to a landing built against the outside wall, and running the full width of the hall. From this landing ascend two runs of equal length, one upon the right, the other upon the left, these runs being parallel with the first one, and finishing at the second story on a landing over the first step of the lower stairs. The plan of the staircase is thus just the reverse of the not uncommon form of colonial staircase where two lower runs on either side of the hall—placed so as not to obstruct a clear passage through the hall—unite in a single flight at the first landing. But the most singular thing about this staircase, which has open strings for the upper runs, at least, is the fact that it must be built without stringers; and, so far as the plates show, this can only have been accomplished by fashioning each step from a solid log and giving it a bearing in the partition-wall of the hall: the under side of each step is wrought so as to have the section of a cyma recta. The result, however it is actually achieved, is a very light-appearing and extremely decorative staircase both in arrangement and workmanship.

It is the fad of the moment to plan houses so that the hallways of not only summer houses, but of city dwellings, shall be ostensibly—and ostentatiously—used as a general sitting-room. In our northern climate such an arrangement, save in some few days in mid-summer, is naught but a ghastly fraud; but here is the hall at Brandon, which shows how in another climate the stairway-hall may be the most sensible of family gathering-places, central, hospitable, airy, and partaking of the characteristics of study, parlor, den, boudoir,

¹ "Examples of Domestic Colonial Architecture in Maryland and Virginia." Compiled, photographed and published by James M. Corner and E. E. Soderholtz. Boston Architectural Club. Boston. 1892.

armory and so on. It makes one thoroughly envious of the gentleman who, in the obscurity of the place, is seen to have a generous study-table before him littered up in the way that indicates either that he is a bachelor and looks after his own housekeeping, or else has taught wife and servants that most difficult of lessons — "let my things alone." The exterior of Brandon is not as imposing as that of Homewood, but it has the same general arrangement — a central building with flanking pavilions connected together by low corridors, an arrangement of parts that is expensive to keep in repair, and, because of want of concentration, must create a needless expenditure in the way of domestic service, which, as service in the South is negro service, implies a certain slovenliness. In fact, most of these Virginia buildings and their surroundings have a rather unkempt and untidy air, but for all that, an air that has its interest, and one which would remain unknown to us but for this portfolio.

"Of a truth, *beau sieur*, the stairways of these old houses on the Cité are steep and narrow and the door through which I reach thee has crushed the plume on my new hat. Does Art house her servants not more seemingly? It seems not, else one whose wit is so nimble and whose crayon skims as rapidly as thine is said to do, would have a fairer chamber than this dismal garret.

"I have sought thee out because the fair dame, my wife, has heard gossip of thy skill and naught contents her but that it shall be thou and no other who shalt make her dreams substantial things. I but serve as her voice. But first understand that any dream that that fair lady chooses to have, I have the means to bring to pass, if but gold be needed. It was not for slight gain I followed our royal Francis into Spain, for though disaster overtook us, I kept me together a few lances, and many is the lonely monastery I have had the pickings of. See, this chain came from the neck of an image of our Lady of Compostello and these buckles and these fat crownpieces were once a golden chalice. So, know that I speak in all seriousness.

"This then is the case: the fair Isabel, my sweet lady, sickens of the town and pines for the freer air, where foul smells do not rise from the gutter, where vile refuse thrown from the window above does not put at risk the gay attire of the passer, where the smoke of the passing flambeau does not waft into the face of her, who at her casement above, listens to the song of a lover below. She wills to leave the town and it is thy task to prepare for her a home, yet not for her alone: there goes with her a gallant company of brothers, cousins, friends, with wives and with full households of domestics and armed retainers, at least five hundred souls. Nay, raise not thy eyebrow, there is gold enough and to spare.

"For this joyous multitude — for they are all young, have all journeyed here and there, some even to Rome — thou must at once prepare houses — not sombre dwellings, but such as happy folk may live in and not mope and pine; with broad windows set with colored glass, so that gay lights flash over fair faces as they move; with generous approaches and wide doors, so that all may feel that welcome waits for them; with cunning nooks and corners, so that some dame, not too discreet, may find fair chance to trick the watchfulness of her too jealous husband; with chambers fit for fair dames and maids to lie in; with kitchens where is space for seasoning the generous feast, and halls where those of birth may sit and feast a grade above their baser fellows. Let all be gay and graceful, but still do not forget that if one would keep his gold, if he would save his daughter's honor and hold his own amongst his neighbors, his doors must be strong as well as wide and here and there must be the floorless machicouli and the sly loop-hole whence the loud musketeer may speak. Stop, I forget one thing, the fair Isabel bids thee take heed to thy roofs; let them not be flat like the pagan temple's, nor bulbous like those beneath which worship the Mohamedan dogs, but let them crown thy buildings, as her cap coifs the head of a fair Picard maid.

"A place of public meeting must be had and therein must thou arrange so that we may gayly watch the antics of these strange Italian mummers. And forget not that the youths and damoiselles must be trained, the one in all that serves to make a man and gallant cavalier and the other in those graceful exercises with needle and tambour. Nor overlook the stabling for our war horses and our ladies' genetis and let the kennels for our wolf-hounds be not dark nor foul smelling.

"I see thy eye kindle and feel thou understandest already my lady's fancy and that she will be well pleased with thy diligent interpretation of her wishes. But thou hast not yet heard all. A river flows beside the place where thy mason fellows are to build in keeping with thy pencil's indications. Now my sweet lady is a *dévôte*, oh yes, *tres dévôte*, and she will hear naught but that she shall have a holy chapel upon the farther side and, that she may not wet her dainty feet at the ford, a bridge must span the stream.

"This then is thy task and I rely mightily upon thy skill and rapid deftness. One other thing must thou do, thou must make at least two devices for each building — hostelry, church, manor and château, so that my good dame may exercise her woman's right and choose that which pleasurcth her most.

"Now come hither to the window. Nay, draw not back, I am not mad, nor mean to cast thee out. There, look down. Seest thou that mule standing before thy door and those brown bags upon her back. 'Tis wine-skins she bears full, one, of bright Alcantarra and

the other with the mighty wine of Oporto. With their aid thou wilt not require sleep and in eight days when I return, I look to find thy task complete. Now let not fancy halt, nor finger lag. Adieu."

Surely enough, the old maurading free-lance returned in eight days, but he found two empty wine-skins and a dead man, in whose fingers were clutched a paper upon which he had jotted down the particulars of his extraordinary commission. The fair Isabel probably died without having effect given to her fancy and the dead architect's memorandum found its way into the public archives, and a few years ago most have attracted the attention of Mr. H. P. Kirby, who set himself to carry out — on paper — the wishes the long departed lady had hoped to realize. Those who know the exuberance of Mr. Kirby's fancy and the facility with which he handles the features and details used by the architects of the French Renaissance in building their châteaux can easily guess at the character of the work shown upon the fifty plates in this really remarkable collection¹ of architectural fancy-work.



[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HIGH SCHOOL BUILDING, CAMBRIDGE, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

[Gelatin Print issued with the International and Imperial Editions only.]

PUBLIC SCHOOL NO. 4, ALBANY, N. Y. MESSRS. EDWARD OGDEN & SON, ARCHITECTS, ALBANY, N. Y.

PROPOSED CHURCH. MR. E. G. W. DIETRICH, ARCHITECT, NEW YORK, N. Y.

HOUSE AT BARCELONA, SPAIN: STAIRCASE-HALL AND CEILING OF DRAWING-ROOM.

THE SAME: WOODEN CORNICE AND PARTITION.

HOUSE AT SOUTH BETHLEHEM, PA. MR. WILSON EYRE, JR., ARCHITECT, PHILADELPHIA, PA.

COMPETITIVE DESIGN FOR THE MISSOURI STATE BUILDING FOR THE WORLD'S FAIR, CHICAGO, ILL. MR. T. C. LINK, ARCHITECT, ST. LOUIS, MO.

[Additional Illustrations in the International Edition.]

OLD HOUSES, HILDESHEIM, GERMANY.

[Gelatin Print.]

WELL OF QUINTIN MASSYS, ANTWERP, BELGIUM.

[Copper-plate Etching.]

The ironwork of this well was wrought by the noted painter Massys, at the time when he was a blacksmith at Louvain, before love urged him to drop the hammer and take up the brush. The manikin which crowns the structure represents the mythical hero Salvius Brabo, brandishing the hand of the equally mythical giant Antigonius, which he has just cut off.

GROUP OF SCHOOL BUILDINGS, NOGENT-SUR-SEINE, FRANCE. M. ETIENNE, ARCHITECT.

[Copper-plate Etching.]

This group contains besides the usual school-rooms, a *crèche*, a primary school and an industrial school for poor girls, the different buildings connected as shown and so disposed as to afford both covered and open play-grounds.

THE CHURCH OF ST. SYMPHORIEN, TOURS, FRANCE.

A COMPARISON of the view of Lyons, which was published last week, with the plate given this week will suggest a peculiarity of Prout's. He was so anxious about making his buildings prominent that he seemed at times to be indifferent to perspective. Hence, when he has a country suburb to represent, as at Lyons, he is less successful in suggesting distance than when, as at Venice, the planes are marked by continuous lines of buildings. In his church at Tours he had a subject that was circumscribed, and his attention was not diverted by many objects. He was therefore able to make a drawing that is impressive from its richness in Proutesque qualities.

ST. PETER'S COLLEGE, RADLEY. MR. T. G. JACKSON, A. R. A.

ST. MARY'S CHURCH, EASTBOURNE, ENG.

This church is an interesting example of the transition from the Norman to the Early English style of architecture. All the arches of both the nave and chancel arcades are pointed, although retaining characteristic Norman decoration. The chancel arch retains the semicircular form, but, as the section of its mouldings shows is otherwise not wanting in the signs of the gradual change taking

¹ "Architectural Compositions," by Henry P. Kirby, comprising a series of fifty sketches, part of which have been made in connection with actual projects, but many being the results of study during leisure moments. Boston: Bates, Kimball & Guild.

place at the time of its construction. The retention of the earlier shape for the chancel arch was probably the result of an unwillingness to depart from a traditional form in a feature so intimately connected with the ritual division of the building. The comparative weakness of this form is demonstrated by the fact that it has slightly sunk, and the piers supporting it, as well as the nave arcade and the clerestory walls above, are considerably out of the perpendicular. In order to remedy this failure, a pointed arch was inserted above. This is mentioned in several descriptions of the church, and was visible previous to the restoration some years ago, when it was hidden by the plastering. It should be noted that the chancel is at a lower level than the nave. This is evidently as originally built, as the base mouldings to the piers of the chancel arcade clearly testify. The decoration of the chancel arch is richer on the western side than on the eastern.

The very marked deviation of the chancel from the axis of the nave in a non-cruciform church is interesting in connection with the subject of orientation. It is, however, very common in many Sussex churches, as at Pevensey and Ringmer, in the latter of which the inclination is towards the north.

Across the chancel arch was formerly the rood-screen, of which traces may be seen, and the stairs to which were in the southern pier, while there was also apparently another means of access from the stair turret on the north by means of a narrow passage (now blocked up) over the segmental arch which spans the aisle on that side. There is evidence of a squint in the northern respond pier; it was constructed during the late Perpendicular period, and was probably for the convenience of those worshippers who used the aisles, which were most likely added about this time. It is, of course, evident from the arcade and clerestory that there were originally aisles of the same period, but possibly they were very much narrower and unsuited to the accommodation of worshippers.

The tower and the westernmost bay of the nave belong to a very late date, as may be seen by examining the two western arches of the nave arcade and the capitals of the piers in connection with them. This work is apparently later than the tower itself, which would lead to the conclusion that this was built independently, and afterwards connected to the church by means of lengthening the nave to the extent of one bay. It was not uncommon for the erection of a large western tower to occupy a very long period, and this mode of carrying out the work reduced the inconvenience of the building operations to a minimum. Probably the Eastbourne tower was commenced during the fifteenth century, and possibly not completed until the beginning of the following one, when the unsettled state of all ecclesiastical affairs under the Tudors, as well as the introduction of Renaissance art, rendered any new undertakings in connection with church building comparatively rare. It is evident from the style of the windows in the clerestory of the bay which connects the tower with the nave, as well as in the construction of the arches and the attempt at decoration on the half column then added to the original respond, that the old style was fast losing its hold. It seems likely that the actual connection of the tower was not completed until perhaps early in the seventeenth century.

In the chancel are a late Perpendicular sedilia on the south side and an "Easter sepulchre" (restored) on the north. The screens now in the chancel aisles are possibly portions of the old rood-screen. In the aisles there is very little of interest, although the eastern end of that on the south side has a piscina as well as some other traces of early work. There is very little documentary evidence bearing on the history of the church, but the writer was once informed by the late vicar (the Rev. Canon Pitman) that a lease granted by a religious house at Hastings in 1132 stipulated that the sum of two shillings per annum was to be paid to the church of St. Mary at Eastbourne. Possibly this was intended to assist in defraying the expenses of the building, which, from the style of the work, may have been commenced about that time. The Barons of Badlesmere (near Maidstone) held one of the Eastbourne manors, and apparently had a residence near the church, and the place is frequently alluded to in their wills, etc.

The church register dates from 1558, but from a manuscript in the British Museum is taken the following extract from a churchwarden's book of an earlier period, although undated:—"Gave to the women that had their houses burnt and husbands slain and goods taken away two shillings and sixpence." This probably refers to an incursion of the French, which was no uncommon experience for our south-coast towns.

Until the year 1641 it was the custom for the holders of the great tithes to give a breakfast on each of the first three Sundays in August to those who assisted to gather in the harvest. The following notice of the petition for the abolition of this custom, taken from the "Journal of the House of Commons," is interesting:—

"Die Sabbati. 14 Augusti, 1641. 17 Car. I. Whereas it is desired by ye humble Petition of ye improprieate Parson of East Bourne, in ye C. of Sussex, and by ye inhabitants, owners and farmers of ye s^d Parish, y^e a profane custom there currently used in ye time of Divine Service may by Act of Parliament be taken away, and instead thereof Twenty pounds per annum may for ever be settled on ye Poor of ye s^d Parish, ye w^{ch} act canot as yet be considered of in respect of ye very many and great affairs of ye kgdom now in hand. It is therefore y^e day ordered by ye House of Commons upon ye Petition of all Parties concerned therein and ye consent as well of ye

Parson Improprieate as ye Inhabitants expressed therein y^t a Bill be brought in with all convenient speed. And y^t in ye meantime upon ye same consent y^e House notes it fit y^t ye s^d profane custom be immediately taken away, and y^t ye Twenty Pounds per annum, according as it is agreed, be paid by ye improprieate Parson for ye time being to ye use of ye Poor of ye s^d Parish as is humbly desired by ye s^d Petitioners who are concerned therein.

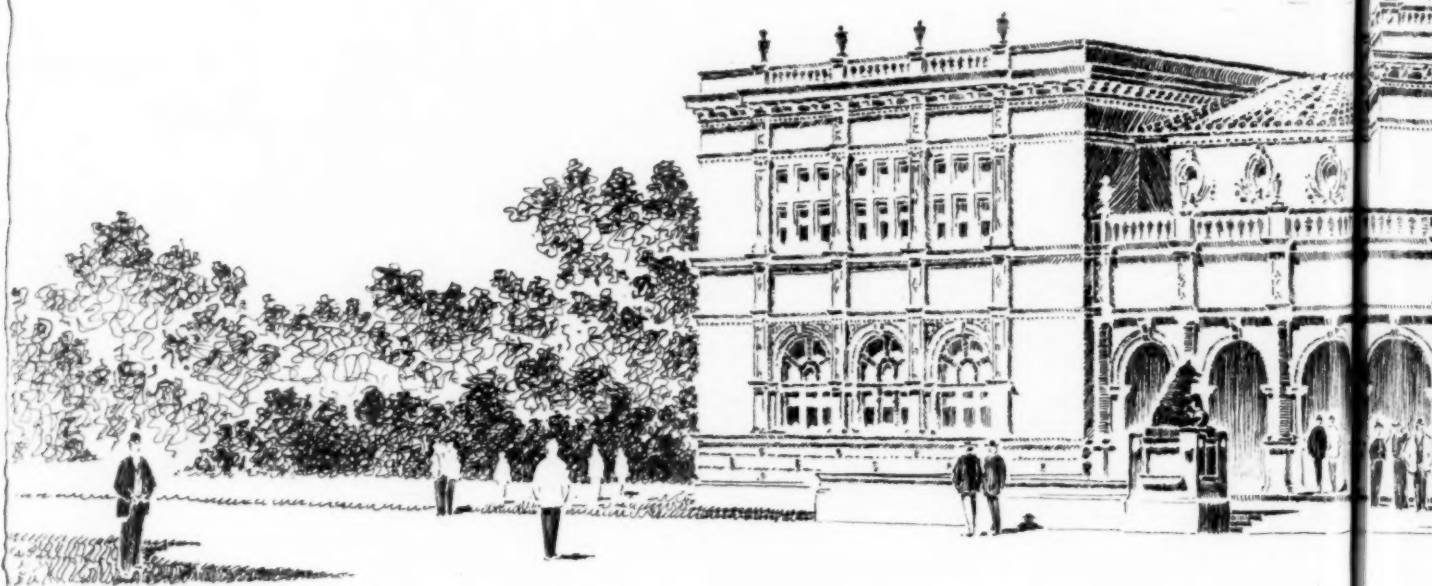
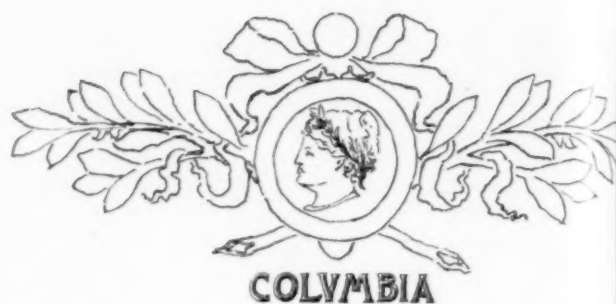
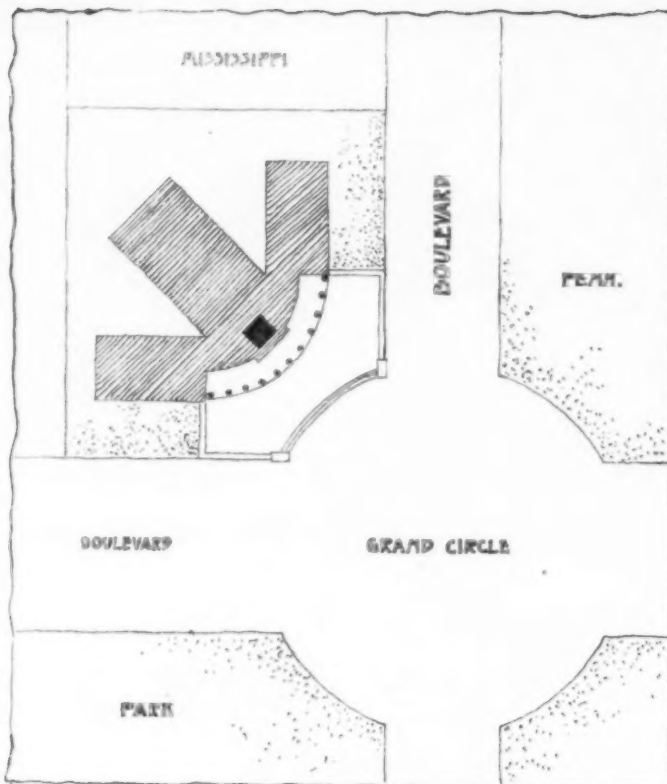
NOTES & CLIPPINGS

THE WORD "GHETTO."—The origin of the word *Ghetto* is definitely traced in an article of the *Jüdische Gemeinde Zeitung* as having nothing at all to do with the word *Giudecca* or *Judaica*. It is Venetian, and is thus explained: The *Ghetto* consists really of two islands, spanned by bridges and intersected by a number of narrow streets, one of the islands being known as the *Ghetto Vecchio* and the other as *Ghetto Nuovo*. The latter up to the fifteenth century was waste marsh land, while the land occupied by the former was drained at a much earlier period and inhabited at least a century before the *Ghetto Nuovo*, or New *Ghetto*, being utilized for many centuries by iron-founders and metal-workers, who built their foundries in the neighborhood. From the use to which the locality was applied, it became to be known as *il ghetto* (the foundry). In time, communication by bridges was established between the other island, now known as *Ghetto Nuovo*, and in the year 1516 the latter was assigned to the Jews for their exclusive use. Gradually both islands became known as *Ghetti*, until the word *ghetto*, was looked upon as an equivalent for Jewish quarter. — *The Jewish Messenger*.

AN ANGRY LANDSCAPE PAINTER.—The French landscapist Carl Rosa, became indignant the other day because no medal was awarded his painting at the Old Salon, so he slashed the canvas with a knife and tore it out of the frame as it hung on the wall. To the bystanders he justified his action by exclaiming that whereas it was conceded that landscapists had improved this year more than painters of any other kind, not a single medal had been awarded them. — *New York Times*.

TRADE SURVEYS

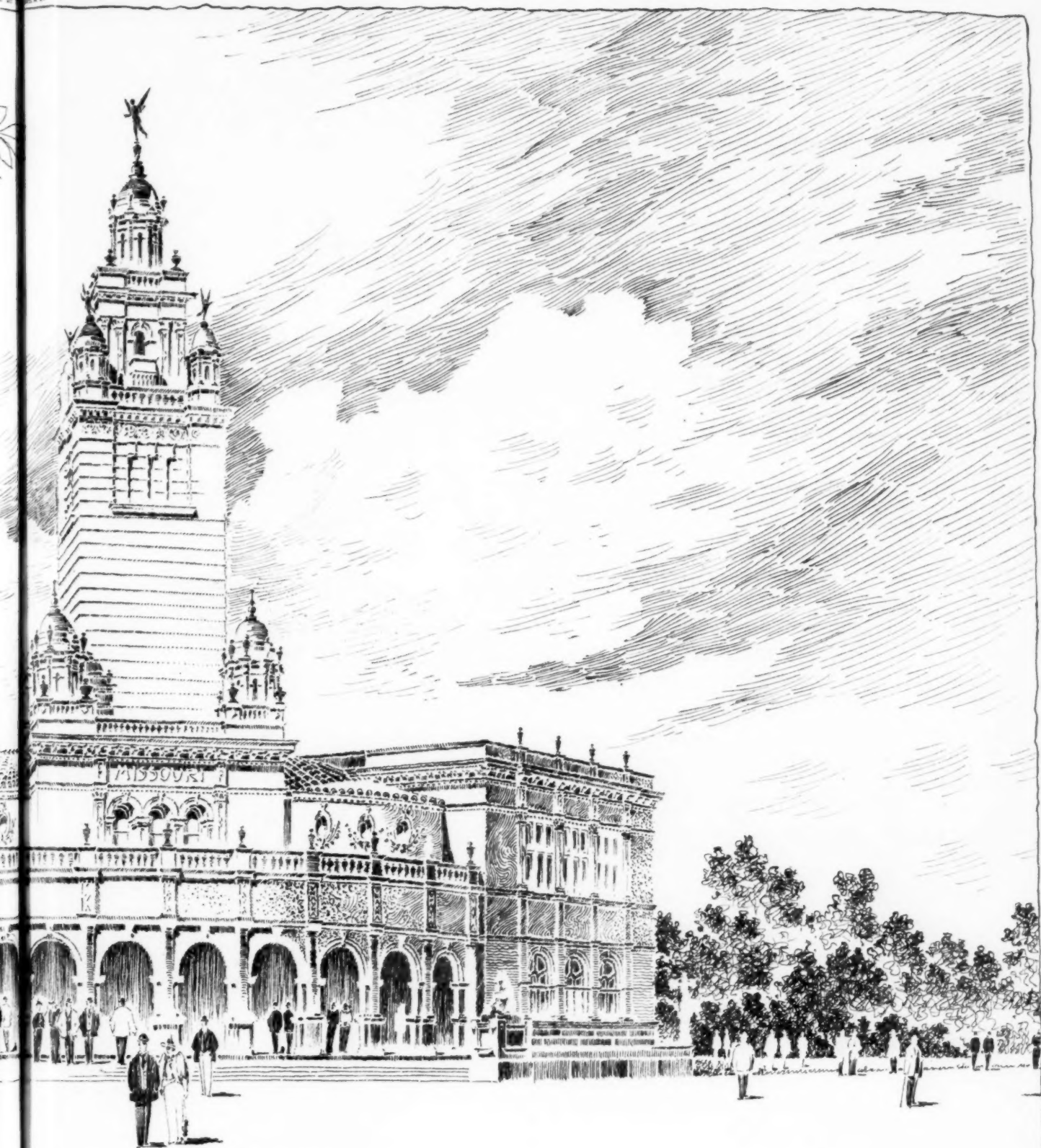
CAUTION is characteristic of the entire business situation. Confidence is stronger than three months ago; prospects are improving, and week by week resources are being covered for enlarged operations in all directions. The outflow of gold continues to attract the attention of those who are directly interested in its retention. The shipments of freight by railroads are increasing week by week; crop reports are very favorable, and are affecting speculative markets. Mining activity is increasing more rapidly, and prices have been generally advanced a trifle. While there is no general hardening tendency in prices, there has been a withdrawal of the lowest quotations that were named during the second quarter of the year. Output is still carefully guarded, and will be for an indefinite time to come. Inquiries for merchandise, manufactured products, building material and material of all kinds are on the increase, with a view of purchasing for summer and early fall requirements. Railroad-building continues at a very low ebb. The iron trade is seriously threatened, and at present writing a suspension of work appears to be probable in the West. Throughout the East, however, a brief season of repairing-work will be continued. Heavy contracts have just been placed at Eastern and Lake ship-yards for ship-building. Within thirty days, an unusually large number of locomotives and cars have been contracted for immediate building. The textile manufacturers throughout New England are very busy indeed, and the hosiery manufacturers of Philadelphia and the East have about as much work as they can comfortably handle. The production of cotton goods in the South is prosecuted with slightly improved margins, and there has been an influx of orders within the past two months. The distribution of boots and shoes from New England points has been larger for the past six months than for the first six months of last year. The production of leather has been slightly stimulated, though prices have been shaded as against last year. The smaller shops of the New England and the Middle States have prospects of a little heavier run of work for the next two or three months. Building activity has been still further stimulated in several cities, and the belief is expressed by builders and architects that this activity extends to a multitude of smaller cities and towns, though there are no means of ascertaining the actual conditions, excepting through the increasing distribution of lumber, shingles and building material. If this evidence be regarded, there is certainly a spurt of improvement in progress. The main point which business men of all classes are keeping in sight is the probability of a general expansion of trade and stronger prices. It is impossible to add anything upon these points worth writing at present. The mistake of crowding the market with goods is being carefully avoided. Business is being done more carefully than in former years; this is shown in the slight decrease in the number of failures and in the amount of liabilities. There is more danger to be feared after an improvement has set in than now, for the reason that when prices improve and business increases, producers will forget the conservatism that controls them, and may and probably will rush into a heavier output, regardless of the market's needs. Investors in new enterprises are very careful where they put their money; there is a lack of perfectly secure opportunities. Dullness in railroad-building cuts off a large field. Foreign money-lenders have representatives carefully looking over the ground on this side, with a view of possible investments in the near future. Quite a number of manufacturing establishments, it is said, will be removed to this side within the next twelve months; at least, a few British manufacturers are now in this country examining sites and making inquiries, with the professed purpose of removing to this side if a further investigation justifies. The improved activity in building operations is something of a surprise to builders and architects, and in four or five of the larger cities it is probable that this year's figures will equal those of last. Industries are not losing ground, but prices will probably run close to the minimum limit of the past six months.

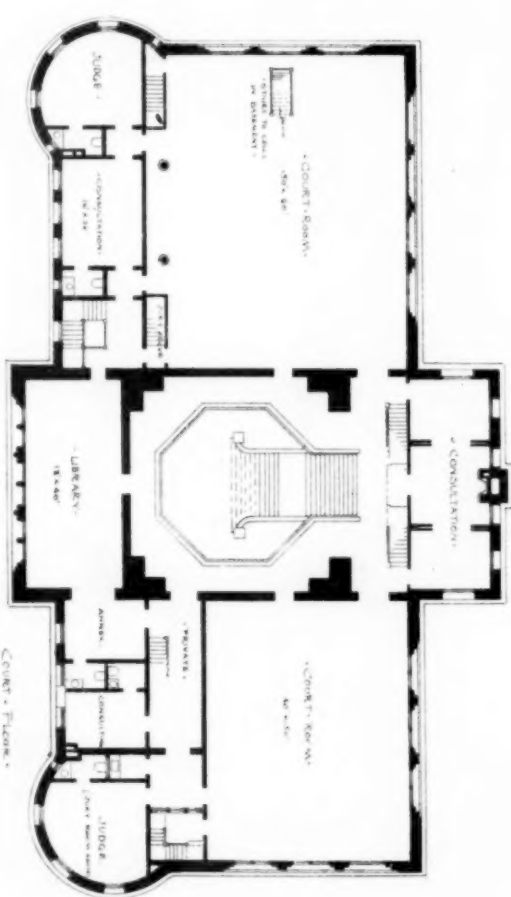
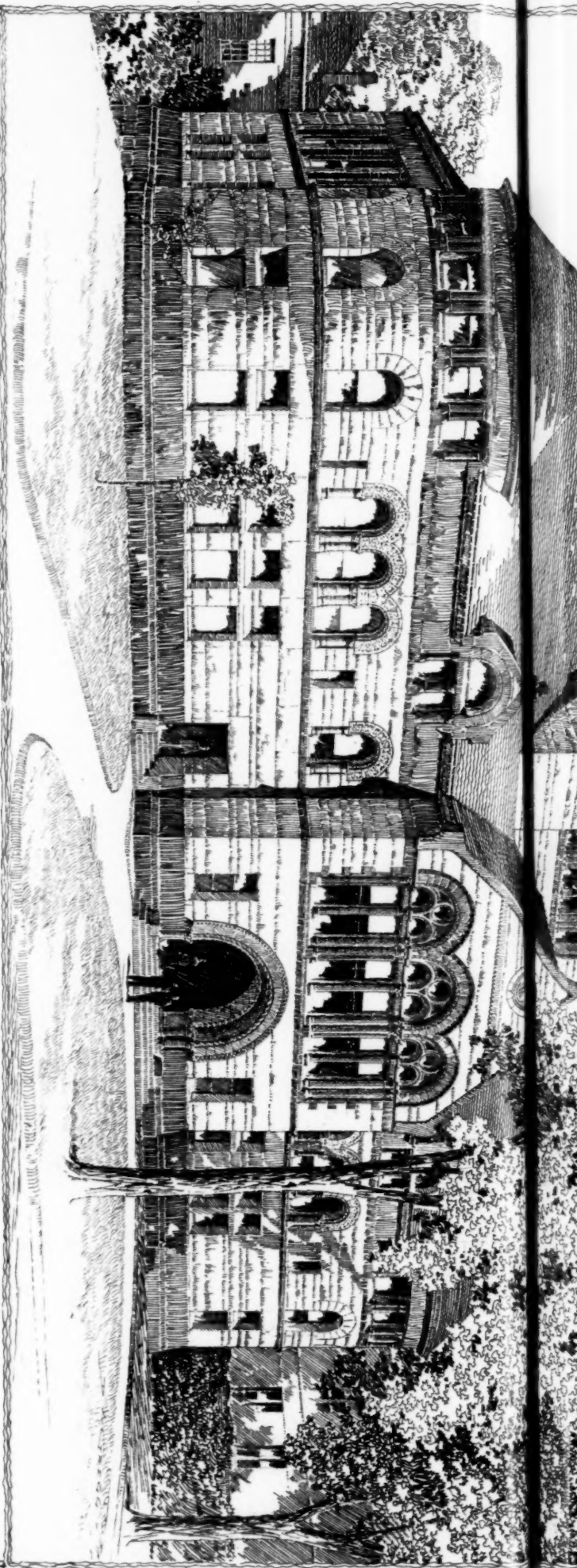


COMPETITIVE DESIGN...

MISSOURI BUILDING FOR THE WORLD'S ·

COLUMBIAN EXPOSITION · T. C. LINK ARCHT.





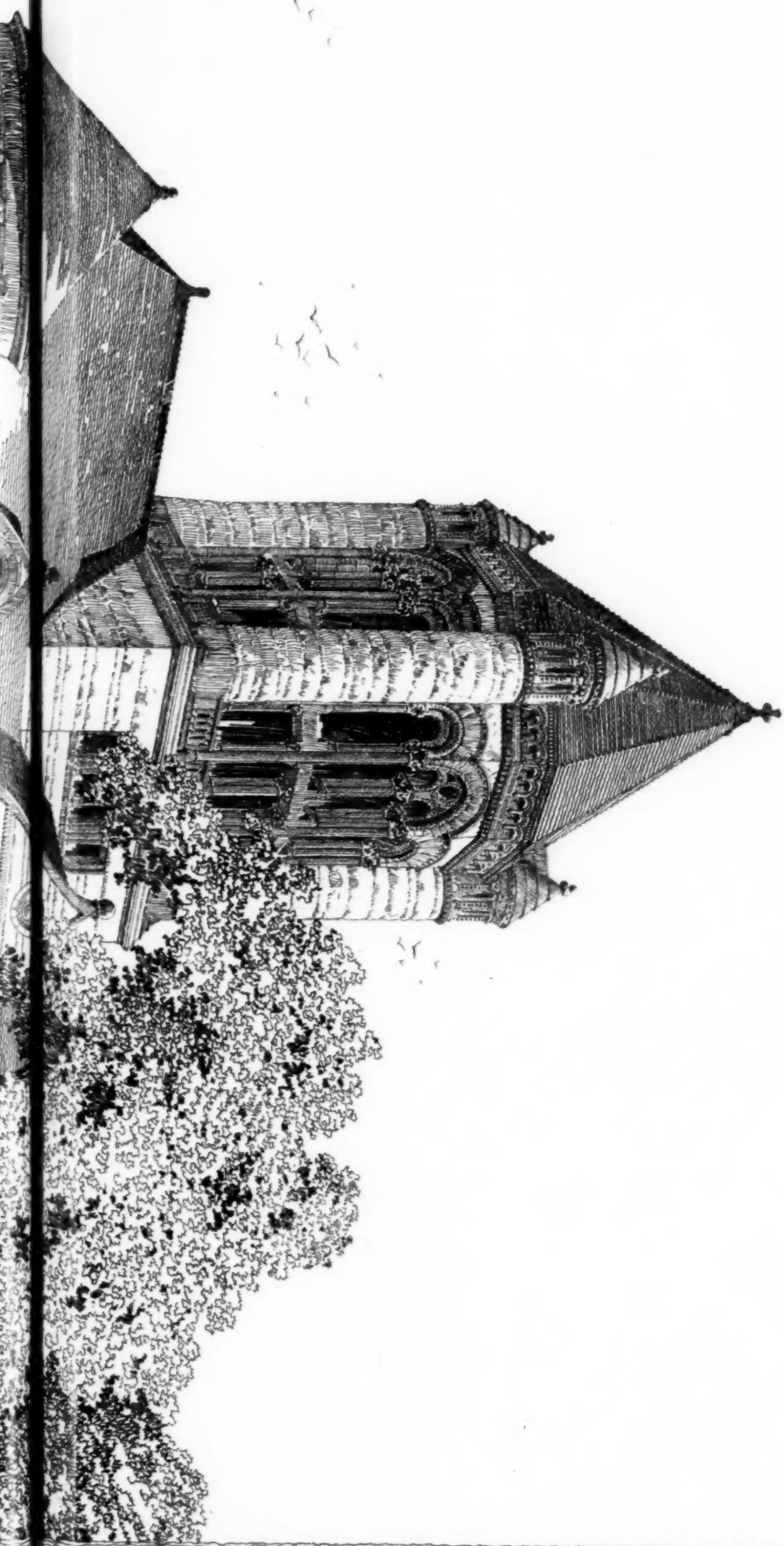
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AMERICAN ARCHITECT AND BUILDING NEWS. Aug. 6 1892

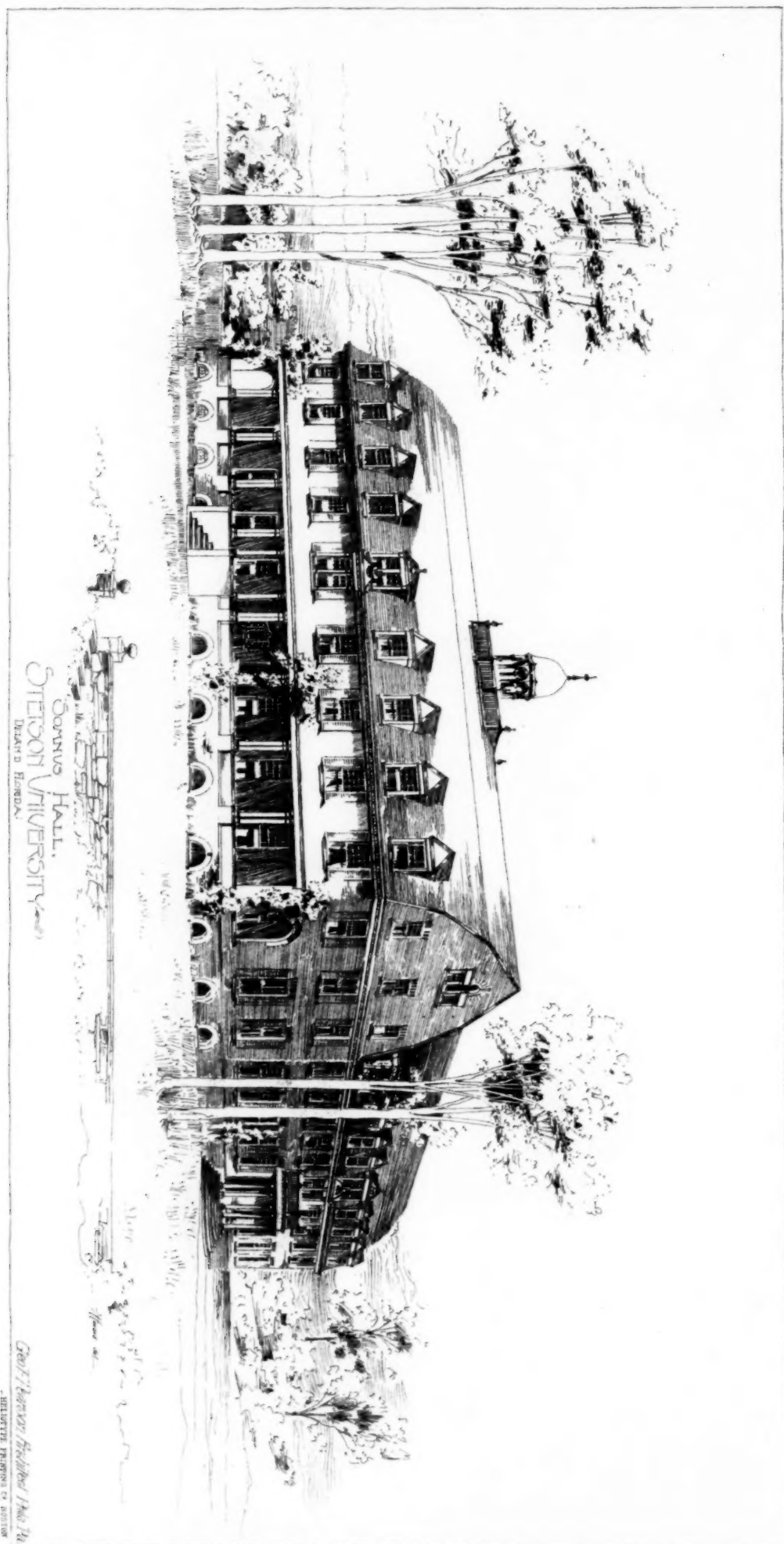
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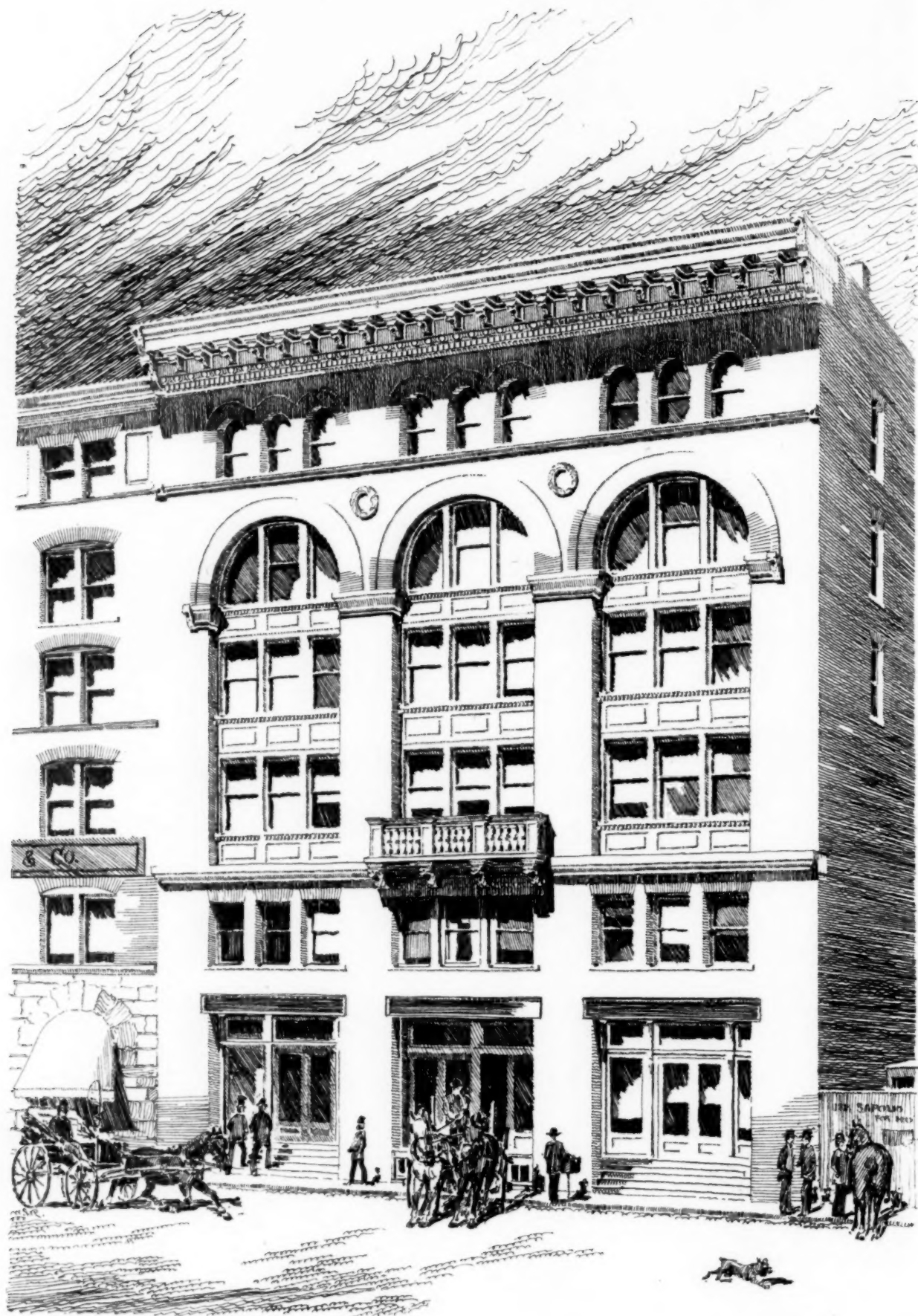
THE BRISTOL COUNTY COURT HOUSE
TAUNTON : MASS.

F. RANK IRVING COOPER.
ARCHITECT.



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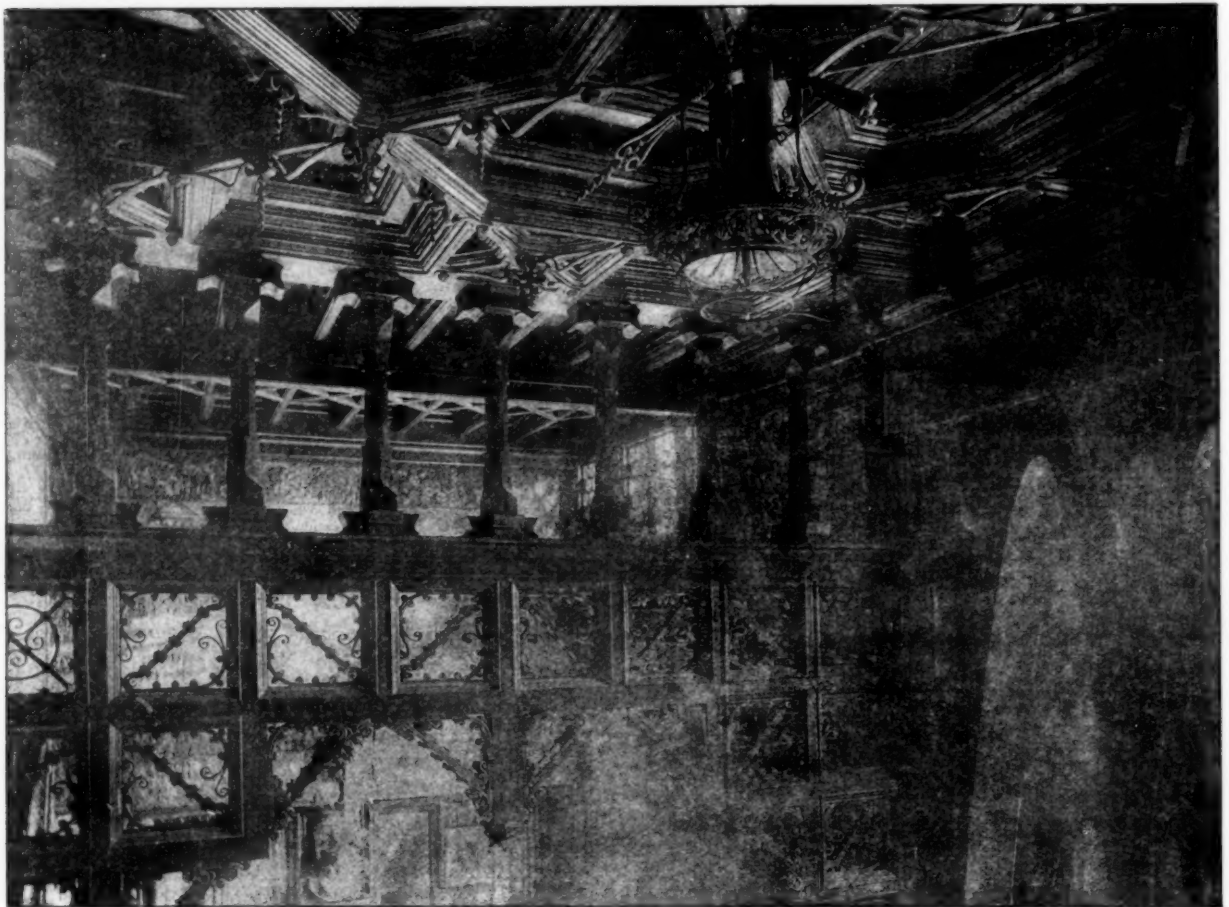




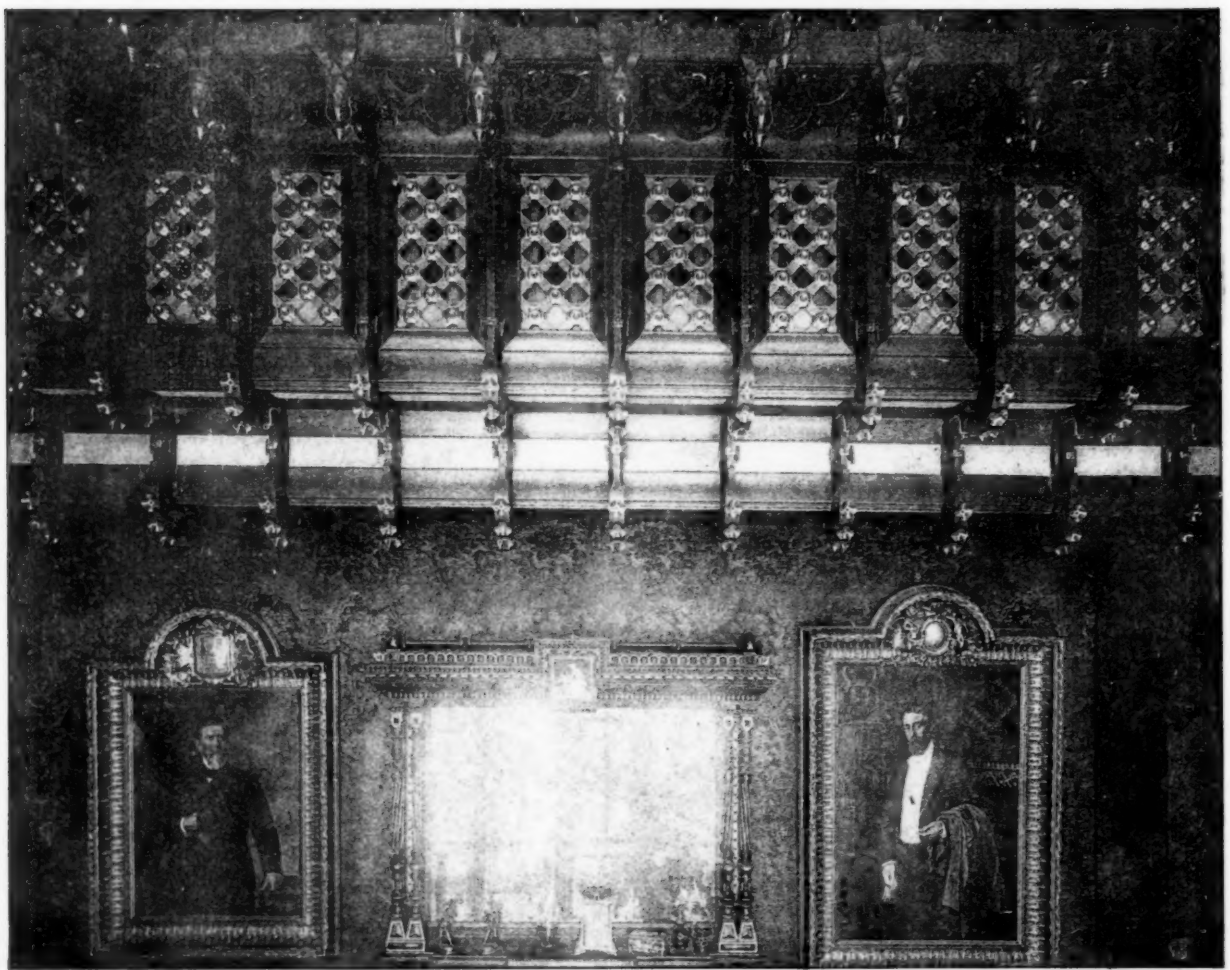
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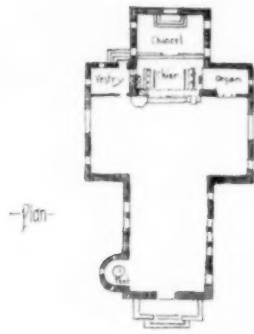


WOODEN CEILING AND OPENWORK PARTITION.



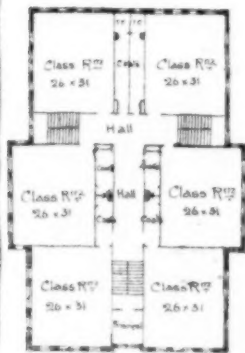
WOODEN CORNICE IN THE DRAWING ROOM.
HOUSE OF SEÑOR GUELL: BARCELONA: SPAIN

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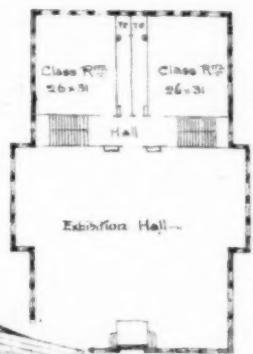
Proposed Church

E. W. Dietrich Architect
10 Broadway N.Y.

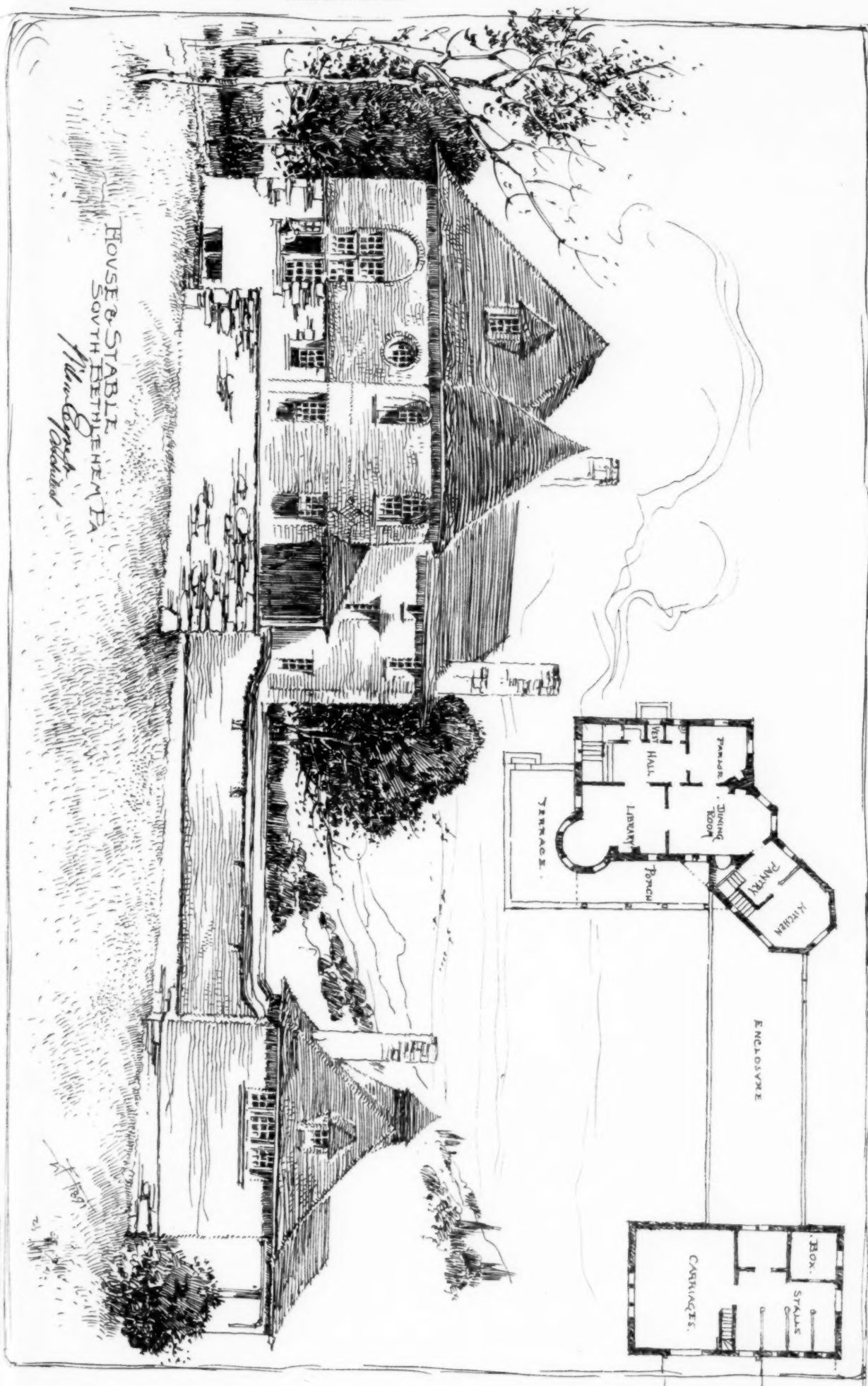


Public School No. 4, Albany N.Y.

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CEILING IN GREAT HALL.

HOUSE OF SENOR GUELL: BARCELONA: SPAIN 89

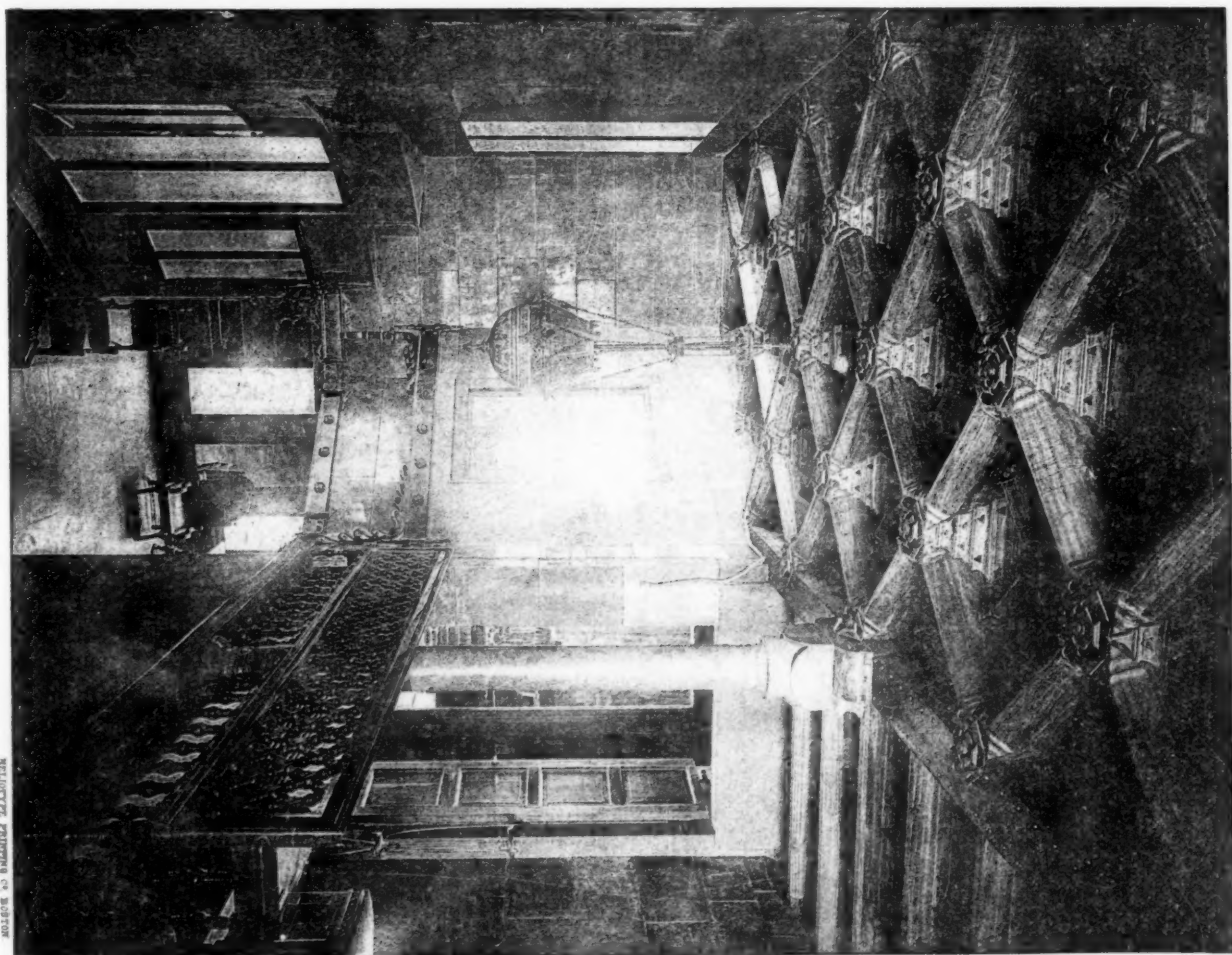
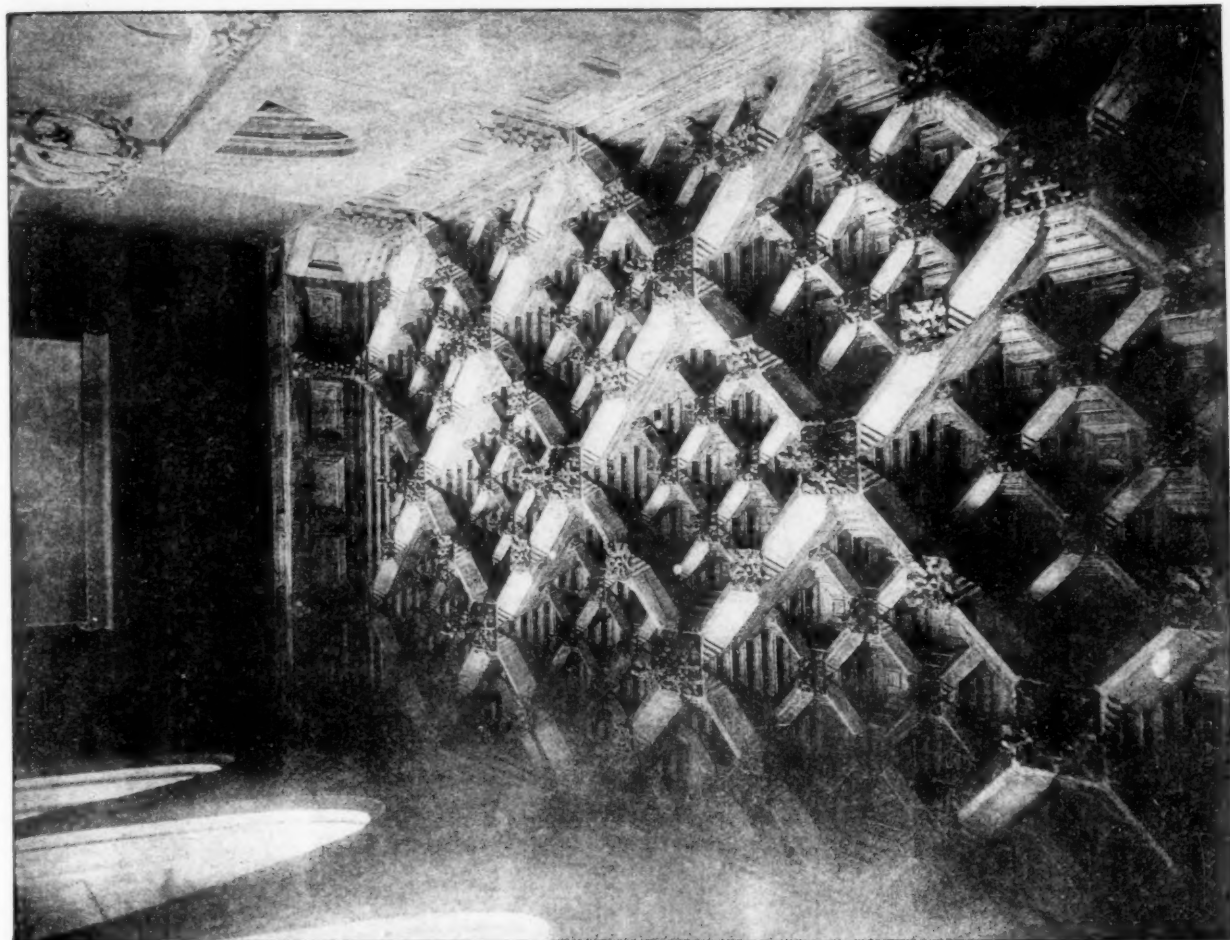
STAIRCASE HALL.

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CEILING IN GREAT HALL.

HOUSE OF SENORS GUELL, BARCELONA, SPAIN.

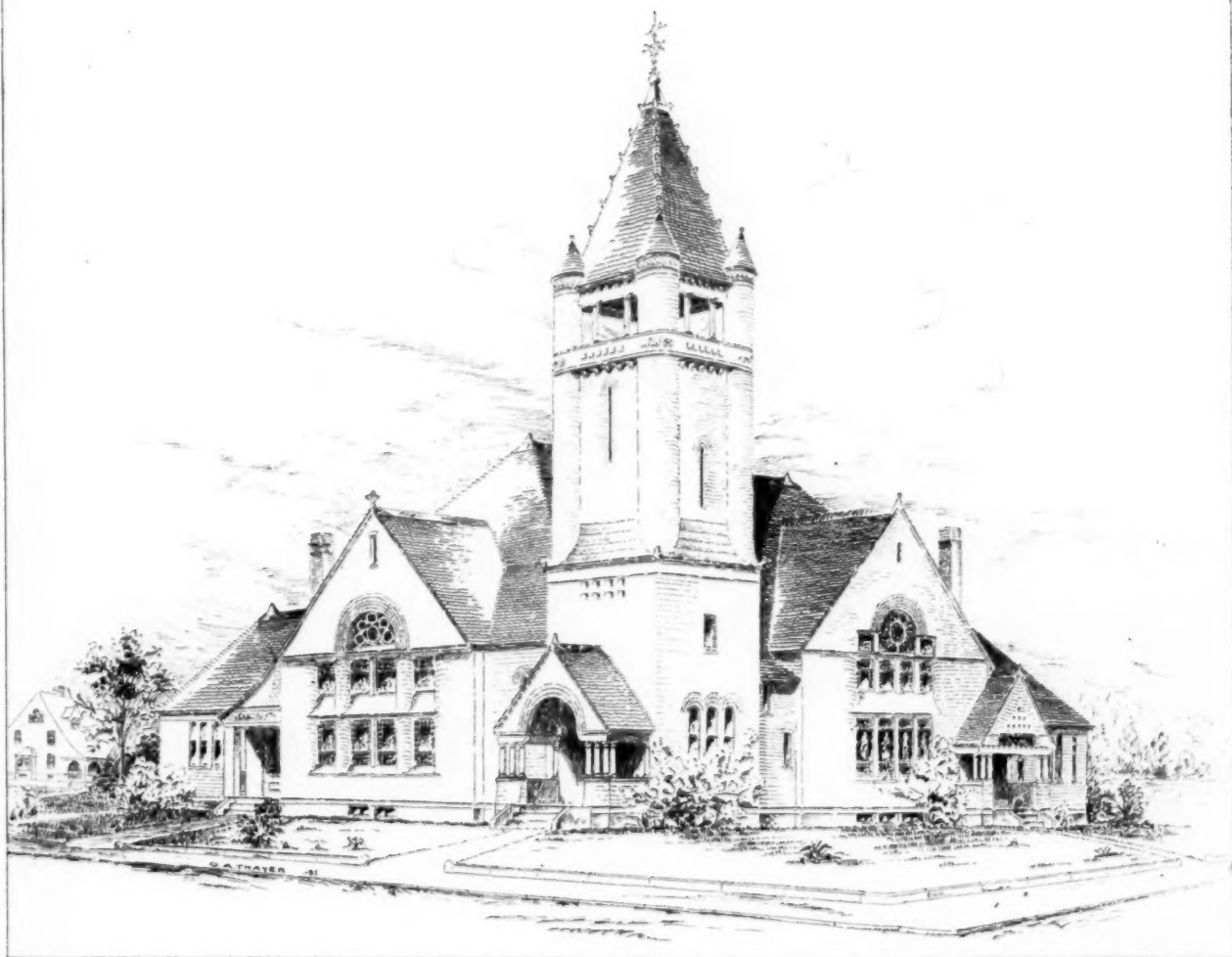
STAIRCASE HALL.



RELIQUARY PHOTOGRAPH BY BOSTON

Accepted
Design for First Congl. Church
Orange Mass

H. H. FRANCIS, ARCHITECT
P.O. Building, Foxburg



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